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A RECORD OF THE PROGRESS OF PHARMACY AND THE ALLIED SCIENCES

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EDITORIAL.

GREETING.

With the completion of another reckoning of time and the advent of the New Year, commences another chapter of history With the initial number of the ninetieth volume of the AMERICAN JOURNAL OF PHARMACY, it is very appropriate to acknowledge our indebtedness to the numerous contributors and patrons and to the host of readers who throughout all these years have sustained the JOURNAL as the exponent of ethical pharmacy and the recorder of pharmaceutical progress.

It is a pleasure at this time to extend to the many friends of the JOURNAL a hearty salutation and greeting of the season and the sincere best wishes to you all for the year 1918.

The AMERICAN JOURNAL OF PHARMACY has been favored with many valuable papers and its pages will continue to be the forum to which new writers will be welcomed and the old contributors invited "to come again."

The retrospect of yesteryear discloses that it was filled with serious problems confronting the nation and the outlook for 1918 indicates that still more momentous will be the events of this year. Let us pray that ere this new cycle shall be completed peace and happiness may reign throughout the world.

While no one can foretell the events of the year and their outcome, we can predict that new trials and responsibilities will be placed upon pharmacists and these will call for the development of the highest ideals of citizenship and of service to our country and to our profession.

G. M. B.

CONGRESSIONAL ENACTMENT VS. DEPARTMENTAL REGULATION.

We in Congress think we enact the laws and we have a clear idea as to our intent and the purpose of the law, but after we have passed a law a Department may frame regulations which modify our intent or even nullify the purpose of the act, and the regulations stand. In a recent interview in which the regulations promulgated by the Treasury Department governing the use and sale of non-beverage alcohol were discussed, the above statement was made by a member of Congress, who has long represented his district in the House of Representatives.

This statement regarding what is continuously becoming more flagrant was unquestionably founded upon existing facts and conditions and voiced a sentiment that not infrequently has been expressed in congressional circles. That Congress will long continue to surrender its constitutional authority or consent indefinitely to a perversion and subversion of its enactments cannot be expected. In the existing status of legislation, with the demand for war measures, the tendency has been toward the centralization of power and the encroachments of the Departments, even though radical, may be temporarily overlooked. In the post-bellum days, when more deliberate thought on such subjects will be given we may expect Congress to again assert its prerogative and reclaim its constitutional authority.

In a previous editorial we referred to the impracticability of certain features of the regulations that have been promulgated for the enforcement of those sections of the Food Control Act and of the War Revenue Act that relate to non-beverage alcohol. Since then, many examples of the unreasonableness of these and the hardships resulting from their enforcement have been presented by physicians, patients, chemists, pharmacists and industrial operators who needed *pure ethyl alcohol for legitimate non-beverage purposes* and whose uses evidently came within the sanction and intent of these congressional acts but not of the departmental regulations.

Ethyl alcohol is an essential raw material of innumerable medicines and in many technical operations, and the physician, pharmacist, chemist and many artisans, whose business demands such, can find no substitute for it.

The moral question of its improper use as a beverage has nothing whatever to do with its proper economical and industrial uses.

While not indifferent to the evils resulting from intemperance, and preferring for many reasons to remain a total abstainer from alcoholic beverages, the writer cannot encourage radical legislation bordering too closely on the fanatical, that fails to recognize the necessities of medicine and the industries for pure ethyl alcohol. Would any sane individual dare to frame regulations, departmental or otherwise, that would demand of the miner of iron ore or the grower of cotton that they must be licensed and under bonded obligation to control to the ultimate consumer the use of their products? The importance of these as raw materials for the metallurgical and textile industries is conceded. Why then is not the importance of ethyl alcohol as a raw material of the chemist and the pharmaceutical manufacturer equally recognized?

The regulations promulgated not only divert the intent of the recent enactments referred to but make it a condition that the pharmacist must violate the Food and Drugs Act and dispense adulterated and poisoned alcohol even on the physician's prescription for alcohol.

Section 6, of the Federal Food and Drugs Act of June 30, 1906, defines the term "drug" and establishes the United States Pharmacopœia and the National Formulary as the legal authority for medicines and preparations *used either internally or externally for the cure, mitigation or prevention of disease.*

Section 7 of that important law in defining adulteration of drugs reiterates the authority of the standards of strength, quality or purity as laid down in the United States Pharmacopœia and the National Formulary.

There can, therefore, be no question raised as to what is the legal standard for alcohol and that this must comply with the requirements of the Pharmacopœia when used or intended for use *for medicinal purposes.*

The regulations promulgated by the Treasury Department make it necessary for the pharmacist to *adulterate alcohol,* even when dispensed on a physician's prescription and for *medicinal purposes,* by the addition of a poisonous substance. Such adulteration and labelling would appear even to the lay mind as an open infraction of the Food and Drugs Act.

An anomalous situation is thus developed, where, by departmental dictum, law-respecting citizens are compelled against their

will and contrary to their judgment and knowledge to commit adulteration of drugs as defined and forbidden by an established law.
G. M. B.

EDUCATIONAL ENDOWMENT.

At the last annual convention of the American Pharmaceutical Association there was a noted awakening to the importance of encouraging research and investigation as a means of advancing the profession of pharmacy. This was ably presented by the President of the Association and likewise in the instructive address of the President of the Conference of Pharmaceutical Faculties. Pharmaceutical research and the necessity for its endowment became thus a leading topic and happily the movement for the founding of the American Pharmaceutical Association Research Fund was inaugurated.

Without in the least minimizing the importance of this movement in behalf of professional pharmacy or modifying the views and personal interest then manifested, the writer fears that in this attempt at top-building the solidity of the foundation, which demands first consideration, may be overlooked.

Research and original investigations must necessarily become the province of the professor and of the postgraduate student, and rightly the thought was impressed at Indianapolis that each teacher in a school of pharmacy should be expected to make annually one or more contributions to the sciences and literature associated with pharmacy. These plans provide for the adornment of the upper stories of the building of professional pharmacy and the need for such improvement is recognized and encouraged.

However, the needs of the beginner in pharmacy, the student, the undergraduate in our pharmaceutical schools is even more important, and the education of these should be established on a safe and strong foundation. The students of today are to become the pharmacists of the future and the leaders of the profession in the next generation. It behooves pharmacy, therefore, to give timely consideration to the educational needs of the initiatives so that a body of fundamentally well-grounded, capable graduates may be prepared to assume the burden and carry on the ideals and upbuilding of the superstructure that we are now planning.

As the sum of human knowledge increases, in proportion is increased the educational requirements for the student. The school must be prepared to advance its curriculum and the student must devote more time and energy to acquiring the broader education required. It is to be expected that future progress will demand more thorough pharmaceutical education and necessitate the adoption of more modern methods of instruction with better laboratory facilities and equipments. The amount of the instruction as well as the quality thereof that will henceforth be considered essential cannot be compared with that in vogue a quarter of a century ago or with that acceptable at the present time.

The cost of buildings and the maintenance of schools has also very materially advanced and the extension of curricula and the adoption of improved methods have all been factors that have added to the expense in the management of educational institutions. It is now generally conceded that the fees charged to the student in technical and professional schools are sufficient to pay only a moderate portion of the actual expenses incurred in his education, and that the average student in attendance could not pay a fee equivalent to the cost.

This deficit must be provided for and will necessitate some changes in the policies of the financial management of such educational institutions as are not protected by state or national aid. Ample endowments for educational purposes must be available if pharmacy schools outside of state universities are to continue and pharmacy is to advance and assume its proper position with the other medical professions. The schools that have heretofore carried on their important duties to pharmacy cannot be expected to maintain their prestige and standing without endowments that will assure the income necessary.

That the Philadelphia College of Pharmacy has been able to maintain its commanding position in pharmaceutical education for nearly a century while relying for financial support upon the fees of its students and the voluntary contributions of its members is a unique and anomalous experience, testifying alike to the economic and conservative management and to the loyalty and professional spirit and ability of its faculty. This experience cannot be duplicated and to longer continue this rather precarious condition is to jeopardize the prestige and the future prosperity of this dear old institution. The necessity for an endowment is too apparent to require any argument, and this must soon claim the attention of the management and merits the earnest consideration of each loyal alumnus and the generous friends of education.

G. M. B.

CHARLES HOLZHAUER.

By Edward A. Sayre.

Charles Holzhauer, of Newark, N. J., was born in Cassel, Germany, in 1848. He was the son of Urban Holzhauer and came to this country with his parents when quite small. They settled in Newark.

His early education was received in the Morton Street public school. At a later date he took a special course at the Newark Academy. In 1862 he left school and entered the employ of Dr. Stewart C. Marsh, who was the owner of the old drug store at the northwest corner of Broad and Market Streets. The doctor had an office upstairs; the store was under the management of Peter P. Saunier. The clerk was John Woods, and Charles Holzhauer was the junior, expected to do everything: bottle washing, clean windows, show cases and bottles, sweep and dust, omitting nothing that was at that time considered as the work of the boy who was to learn the drug business. All these things our subject did, and in addition was able to study and pick up sufficient knowledge so that when Mr. Woods died, he became the clerk and another did the drudgery.

In 1870 the store was sold to Dr. W. A. Conover. In 1879 he sold a half interest to Mr. Holzhauer. The doctor was restless and anxious to get out of business, so that a year or so later Mr. Holzhauer became sole owner.

Early in life Mr. Holzhauer joined the Central Presbyterian Church, then located on Washington Street, near Market. He was active in both Sunday-school and church work, serving as superintendent of the former until it was deemed advisable to sell the edifice and move to a new location. He did not go to the new church, but joined the High Street Presbyterian, located conveniently to his home. Here he was just as active in the work until the time of his death. The *Sunday Call* on November 25 contained the following:

Yours Truly
Charles Holzhauer

"Charles Holzhauer, who died in this city last week, one day heard some one make a sneering remark about Sunday-schools. He could not keep silence. 'Let me tell you,' he said, 'that all the success I have had I owe to a Sunday-school. I was just a little German boy living on 'the hill' with apparently a poor future before me. I was taken into the school of the old Central Presbyterian Church, and to the influences which there surrounded me and the valuable friendships which I then gained I attribute such position as I have now.' He was himself a superintendent of Sunday-schools for several years. Every Newarker knows that he was also a successful business man and a respected citizen."

In 1874 Mr. Holzhauer joined the New Jersey Pharmaceutical Association. He was its president in 1881. Ever a faithful attendant, never missing a meeting if he was in the country, he will be missed here more than anywhere else. He was a good listener, with a judicial mind. When a lull came in the discussions (which were often warm and full of fire) he would get up, and, in a few quiet words, say something that carried so much force that he usually had the last word.

One of the old guard, in a letter since his death, said: "When I was active in Association work I always felt that any measure that I proposed, if backed by Holzhauer, was proper, worthy and promised success. He was a grand, good man."

Another said: "What will the New Jersey Association do without Holzhauer?"

The original Pharmacy Law for New Jersey became operative in 1877; Governor Bedle named Charles Holzhauer as one of the five members to carry out its provisions. James R. Mercein, of Jersey City, was president of the first board; three succeeding governors reappointed Charles Holzhauer in 1880, 1883 and 1886, and he served as president from 1880 to 1890, when he retired.

Mr. Holzhauer entered the New York College of Pharmacy in 1871 and was graduated in the class of 1873. He joined the College November 3, 1881, and became a life member in 1882. He was a vice-president in 1891. He became a trustee in 1892, serving as such for five years until 1897.

Mr. Holzhauer joined the American Pharmaceutical Association in 1873, was first vice-president in 1905, local secretary in 1916, chairman of the Section on Historical Pharmacy 1915 and 1916. Was elected president and installed at Indianapolis, 1917.

The New York State Pharmaceutical Association organized in 1879. Mr. Holzhauer attended their meeting in 1883. He was made an honorary member. He appreciated this very much and frequently attended their meetings. The last one was in 1913 at the Catskill Mountain House.

Mr. Holzhauer was at the Holzhauer Drug Store in his usual good health apparently, on Monday morning, November 19; he went home to lunch with his son about one o'clock, had a nap and was having his usual romp with the grandchildren when, without a moment's warning (with the youngest in his arms), he was stricken at four o'clock and at four-thirty had passed away from a hemorrhage of the brain. The funeral services were held at the High Street Presbyterian Church November 21. The gathering was a notable one. People from every walk in life, men and women, were there, with many prominent business men of the city, and pharmacists from such nearby points as could gather on short notice, Acting President A. R. L. Dohme and four ex-presidents of the American Pharmaceutical Association and numerous ex-presidents of the New Jersey Association being in evidence. Burial was in Mt. Pleasant Cemetery, of which he had been one of the managers.

Mr. Holzhauer is survived by a widow, Mrs. Louise S. Holzhauer, a son and four grandchildren; also by two sisters.

PODOPHYLLUM PELTATUM LINNÉ.[1]

NOTES ON THE TIME OF COLLECTION.

By G. A. Russell,
Washington, D. C.

The collection of *Podophyllum peltatum,* or, as it is more commonly known, mandrake, is carried on in more or less of a haphazard manner through the entire growing season. The collector does not concern himself with the quality of the rhizome, his one object being to collect as much as possible each day in which he labors. From the results obtained in this investigation it is clearly shown that a campaign carried out with the idea of giving the collector proper information as to the time of collection would benefit not only the collector but the manufacturer of podophyllin as well.

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[1] Published by permission of the Secretary of Agriculture.

In the spring of 1916, the writer had occasion to collect a quantity of mandrake rhizome in Fond du Lac County, Wisconsin. At that time it was decided to collect samples throughout the growing season and later to make comparative examination of these samples. Accordingly a quantity of drug was collected at various periods from May 10 until June 14. All material collected was from the same patch found growing in a rather open or glade-like second growth of poplar and sumach. The remainder of the samples were collected in Green Lake County, Wisconsin, from June 14 to October 8, and came from the same type of soil as the earlier collected samples.[2] The entire series of samples may be considered as very representative of mandrake growing in Wisconsin, since it is almost invariably found growing in greatest abundance in open or semi-open glades on what is known as Miami silt loam, deep phase.

Each sample as collected was washed free of all adhering soil, the roots removed, and the rhizome and roots weighed separately and then carefully dried in the shade by means of artificial heat which never exceeded 50° C. After drying the rhizome and roots were again weighed, packed in cloth bags, and preserved in a dry place until examined. The results of the moisture determinations are given in Table I.

TABLE I.

Percentage of Moisture in Fresh Rhizome and Roots of Podophyllum peltatum.

Material	Lot number	Date collected	Moisture lost in drying (per cent.).	Remarks
Rhizomes . . .	1	May 10, 1916	78.58	Plants just coming out of the ground.
	2	May 23, "	80.00	Plants just in bud.
	3	June 14, "	80.38	Plants at close of flowering season.
	4	July 30, "	66.66	Fruit ripening on plant.
	5	Aug. 4, "	66.66	Plant foliage beginning to dry up.
	6	Oct. 8, "	65.00	Plant foliage completely dried away.
Roots	1*a*	May 10, "	78.95	Same as lot No. 1.
	2*a*	May 23, "	80.27	" " " " 2.
	3*a*	June 14, "	81.00	" " " " 3.
	4*a*	July 30, "	76.93	" " " " 4.
	5*a*	Aug. 4, "	76.93	" " " " 5.
	6*a*	Oct. 8. "	70.05	" " " " 6.

In the foregoing table Lot No. 1 represents a spring-collected drug and Lot No. 6 a fall-collected drug. The amount of moisture in the freshly dug rhizome and roots is of interest in that it gives an index as to the amount of water present during the greatest activity of the plant. The amount of rainfall exerts some influence on the amount of moisture present in fresh herbs and roots and in order to compare the percentage of moisture present with the precipitation in inches, the rainfall by months at Fond du Lac, Wisconsin, is tabulated in Table II.

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[2] Collected by N. R. Mueller, of the Office of Drug-Plant and Poisonous-Plant Investigations, Bureau of Plant Industry.

TABLE II.

Rainfall in Inches Each Month during the Growing Season of Podophyllum peltatum in 1916 at Fond du Lac, Wisconsin.

Month.	Precipitation in inches.	Moisture in rhizome.		Moisture in roots.	
		Lot.	Per cent.	Lot.	Per cent.
April	2.19	1	78.58	1*a*	78.95
May	3.58	2	80.00	2*a*	80.27
June	4.88	3	80.38	3*a*	81.00
July	0.43	4	66.66	4*a*	76.93
August	4.72	5	66.66	5*a*	76.93
September	4.45	6	65.00	6*a*	70.05
October	4.76				

The largest amount of water present in both rhizome and roots occurs in the month of greatest rainfall and also when the plants are at the height of growth. In July but very little rain fell and the lack of moisture is reflected in the rhizome and to a less degree in the roots. In addition to lack of moisture, the plant had at this time passed its greatest growing period and was now beginning to become dormant, which accounts for some of the decrease in moisture content. This decrease in moisture content is more marked as the plant becomes more and more dormant even though the rainfall was plentiful.

Eight months after the last lot of rhizomes and roots was collected all the samples were examined. The dry material was ground to a No. 60 powder and the following determinations made on the powdered material: moisture, soluble ash, insoluble ash, total ash, and resin.

Moisture.—The moisture was determined by heating a weighed portion of the ground material in a flat milk dish at a temperature of 100° C. for two-hour periods until the weight was constant. After each heating the sample was cooled in a desiccator over calcium chloride. The loss in weight is taken as the amount of moisture present. The results of moisture determination on the dry powdered drug are given in Table III.

Ash.—The ash was determined as outlined in Bureau of Chemistry Bulletin No. 107 (Revised),[3] both soluble and insoluble ash being determined in the oven-dried material. The results are also given in Table III.

Table III.

Percentage of Moisture and Ash Present in Air-dried Podophyllum peltatum.

Material.	Lot number.	Moisture. per cent.	Soluble.	Ash per cent. Insoluble.	Total.
Rhizome.....	1	8.66	0.566	3.762	4.328
	2	8.82	0.650	3.770	4.420
	3	10.06	0.764	3.001	3.765
	4	9.12	0.579	3.531	4.110
	5	9.27	0.887	3.884	4.771
	6	8.61	0.969	3.948	4.917
Roots.......	1*a*	8.91	0.843	5.656	6.499
	2*a*	9.34	0.959	5.858	6.817
	3*a*	9.88	0.604	4.369	4.973
	4*a*	9.74	0.977	4.446	5.423
	5*a*	9.55	1.084	4.451	5.535
	6*a*	8.88	1.202	4.068	5.290

The amount of moisture remaining in air-dried podophyllum varies with the time of collection. Spring and fall-collected samples contain practically the same amounts of moisture while samples collected at intermediate periods vary to a considerable degree. Samples 3 and 3*a*, collected when the plant was at the height of its growing period, contain the greatest amount of moisture, both in the fresh and in the air-dried drug.

A comparison of the ash content of both the roots and rhizome is of special interest. The Pharmacopœia, IX, states that "Podophyllum yields not more than 3 per cent. of ash." None of the samples examined yield as low as 3 per cent. of ash. All of the samples of rhizome yield over 4 per cent. of ash, with the exception of sample No. 3, which yields 3.765 per cent. Several checks run on each sample yielded like results. The ash of the roots was found to be considerably greater than that of the rhizome, in some samples running to over twice the amount specified in the Pharmacopœia. The latest Pharmacopœia allows the roots to enter as part of the official drug. The ash content of the rhizome and roots combined will average about 5 per cent. in the samples examined. Since the limit of ash in podophyllum is specified as a test for doubtful samples it will be well to bear in mind that the drug examined in this investigation was absolutely authentic and yet had an ash content much above the specified 3 per cent.

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[3] Official and Provisional Methods of Analysis. United States Department of Agriculture, Bureau of Chemistry Bulletin No. 107 (Revised), 238.

Resin.—The resin was extracted from each sample by the method outlined in Pharmacopœia, IX. The temperature of the water used was uniformly kept at 6° C., and all precautions were taken to handle each sample in the same manner. In no case did the resin coalesce or aggregate into lumps during drying and it was not essentially necessary to powder in a mortar, although each lot was thus treated in order to make it absolutely uniform. The results of the resin determinations are given in Table IV.

TABLE IV.

Percentage of Resin of Podophyllum in Air-dried Podophyllum peltatum.

Material.	Lot number.	Resin (per cent.).	Color of resin.
Rhizome	1	6.15	Greenish yellow
	2	6.00	Light greenish yellow
	3	4.57	Yellow
	4	3.60	Greenish yellow
	5	3.30	Dark greenish yellow
	6	4.22	" " "
Roots	1*a*	7.76	Greenish yellow
	2*a*	7.10	Light greenish yellow
	3*a*	5.40	" " "
	4*a*	3.30	Greenish yellow
	5*a*	4.15	Light greenish yellow
	6*a*	4.96	" " "

From the results tabulated in Table IV it will be seen that the spring-collected drug yields the largest percentage of resin. At this time the plants were just sending up aërial shoots and the activity within the plant cells was probably at a maximum. As the plant grows the resin content in the dry material lessens. When the plant had reached its maximum growth the percentage of resin present was at the lowest point. An increase in resin is noted in the drug collected after the plant had begun to die away in the fall.

Recalculated on a basis of green weight the results appear in a different light. The recalculations are given in Table V.

TABLE V.

Available Resin in One Kilogram of Fresh Podophyllum peltatum.

Material.	Lot number	Weight fresh drug (grams).	Available air-dried drug (grams).	Available resin (grams).
Rhizome	1	1000	215	13.2
	2	"	200	12.0
	3	"	200	9.14
	4	"	334	12.02
	5	"	334	11.02
	6	"	350	14.77
Roots	1*a*	"	210	16.29
	2*a*	"	200	14.20
	3*a*	"	190	10.26
	4*a*	"	220	7.26
	5*a*	"	220	9.13
	6*a*	"	300	14.88

But since the ratio of roots to rhizome does not remain constant throughout the season the amount of resin available becomes even more marked when the official drug is taken into consideration. It was found that the roots constituted a certain increased percentage of the total weight of the drug as the growing season advanced until the plant reached maturity. The results of resin determinations on the official drug, rhizome and roots, fresh material, are given in Table VI.

TABLE VI.

Available Amount of Resin in One Kilogram of the Official Drug of Podophyllum peltatum, Fresh Material.

Lot number.	Roots compared with total weight (per cent.).	Available air-dried drug (grams).	Available resin (grams).
1	23	214	13.94
2	25	200	12.55
3	27	198	9.47
4	32	201	7.01
5	30	302	10.55
6	21	340	14.80

From the collector's point of view, drug collected in the late fall will yield him the best returns. The manufacturer, on the other hand, will necessarily have to work over more powdered material for a slight gain in the amount of resin.

The various resins were further examined, and the data obtained on their behavior toward solvents as well as the ash content are tabulated in Table VII.

TABLE VII.

The Ash Content of the Resin of Podophyllum peltatum and the Percentage of Resin Soluble in Various Solvents.

Material	Lot number	Ash (per cent.).	Soluble in Alcohol (per cent.).	Soluble in Ether (per cent.).	Soluble in Chloroform (per cent.).
Rhizome	1	0.739	98.68	78.32	71.00
	2	0.377	99.12	80.03	73.25
	3	1.676	93.68	71.01	62.68
	4	2.049	91.80	70.50	62.75
	5	1.566	91.16	70.50	62.30
	6	0.731	98.51	77.00	68.50
Roots	1*a*	0.393	98.31	74.22	68.25
	2*a*	0.208	99.75	76.08	70.00
	3*a*	0.362	98.13	73.00	60.00
	4*a*	1.150	97.47	68.46	58.75
	5*a*	0.481	93.80	69.13	61.14
	6*a*	0.418	98.32	73.31	66.23

When treated with hot water lots Nos. 1, 2, 3, 6, 1*a*, 2*a*, and 6*a* went into practically complete solution. The remainder of the lots could not be wholly dissolved in hot water with several minutes' boiling. Like results were obtained with sodium hydroxide and with potassium hydroxide except that all the lots were soluble when the alkaline solution was heated.

The Pharmacopœia directs that resin of podophyllum should contain not over 1.5 per cent. of ash. Three of the samples of resin from the rhizome contain more than 1.5 per cent. of ash, while all the resins from the roots contain considerably less than 1.5 per cent. of ash, in fact with one exception, that of lot 4*a*, they all contain less than 0.5 per cent. Those resins in which the ash content is above 1.5 per cent. do not conform closely to the other Pharmacopœial requirements. It is quite probable that the requirements were drawn for podophyllum and the resin of podophyllum with the mid-season collected material in mind.

A small percentage in every sample examined was found insoluble in alcohol. This percentage of insoluble resin increased with the growing season and was greatest when the aërial part of the plant had reached its maximum growth and was beginning to die away. Like solubility results were obtained with ether and with chloroform.

Summary and Conclusions.—Six samples of *Podophyllum peltatum* were collected in Fond du Lac and Green Lake Counties, Wisconsin, from the same type of soil, during the growing season of 1916. These samples were examined in August, 1917.

The moisture content of the fresh drug was greatest at the height of the growing season and least after the plant became dormant in the fall.

The ash content of mixed rhizome and roots was found to be in excess of that specified by the United States Pharmacopœia, IX.

The greatest percentage of resin was found in the early spring-collected drug and this resin conforms closely to the Pharmacopœial requirements.

The spring-collected drug, gathered just as the plants began to show above ground, and the late fall-collected drug are both worthy of consideration. The spring-collected drug yields high in resin which conforms more closely to the requirements than does the fall-collected drug. The latter calculated on the basis of fresh material will yield more resin since the rhizome and roots contain less water than the spring-collected drug.

To secure the maximum amount of resin the rhizome and roots of *Podophyllum peltatum* should be collected in the fall of the year after the aërial part of the plant has died down. If spring collection is attempted it should be done before the plant begins to send out aërial shoots. Later than this the resin decreases and the moisture content of the rhizome and roots increases.

From the collector's point of view the fall-gathered drug is best, since it gives the highest yield of air-dried material. The manufacturer will prefer the spring-collected drug since the resin content is high and the amount of dry material to be worked over is relatively much less than when the drug is collected in the fall.

Drug-Plant and Poisonous-Plant Investigations,
Bureau of Plant Industry,
U. S. Department of Agriculture.

THE PREPARATION OF DICHLORAMIN T. AND CHLORINATED EUCALYPTOL 1.2.[1]

By Robert B. Krauss.

From the Henry Phipps Institute of the University of Pennsylvania.

Para toluol sulphondichloramide was first prepared by Kastle, Keiser and Bradey[2] in 1896, who also prepared a number of related compounds. Since its introduction under the name of dichloramin T. by Dakin, Lee, Sweet, Hendricks and LeConte,[3] the production of this substance on a large scale in pure form, as well as that of suitable solvents for its application, have become problems of importance.

As originally used for this purpose dichloramin T. was dissolved in a prepared eucalyptol (chlorinated) and used in this condition or further diluted with prepared paraffin oil (chlorinated).

It was early recognized by the author that the products obtained by chlorination may vary considerably, according to the conditions of chlorination. By continued chlorination, under certain conditions, a chlorinated eucalyptol, specific gravity 1.2, is obtained, which has been extensively studied by surgeons. As a solvent for dichloramin T. it seems to have all the desirable qualities with the exception of the solution being definitely stable. There seems to be some reason to believe that chlorinated eucalyptol 1.2 itself has some therapeutic value.

This evening I will present an outline of the methods for preparing para-toluol-sulphon-dichloramide, and chlorinated eucalyptol 1.2, and the specifications for both as prepared for federal medical authorities.

1. Preparation of the Sulphonic Acids.

Beginning with toluol, the sulphonic acids are formed by mixing equal parts of concentrated sulphuric acid and toluol. On shaking or even on standing the toluol dissolves in the acid. When the top layer of toluol has disappeared the sulphonation mixture is poured into water and neutralized with lime. After filtering, the solution of the ortho and para calcium sulphonates is treated with sodium carbonate and boiled to form the sodium salts and precipitate calcium carbonate. The filtered solution is evaporated to dryness and carefully dried.

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[1] Journal of the American Pharmaceutical Association, January, 1918. Read before the Philadelphia Branch of the American Pharmaceutical Association.

[2] American Chemical Journal, 18, 491, 1896.

[3] Journal American Medical Association, 69, 27, 1917.

2. PREPARATION OF THE SULPHO-CHLORIDES.

The powdered sodium sulphonates are treated with an equal weight of phosphorus pentachloride. After the pentachloride has disappeared the semifluid mass is heated on the water bath to complete the reaction and then poured on ice. The para sulpho-chloride crystallizes after a time while the ortho derivative is a liquid. They are separated by centrifuging.

3. PREPARATION OF THE SULPHON-AMIDE.

The para sulpho-chloride is melted on the water bath and treated with an excess of ammonium carbonate. The odor of sulpho-chloride should no longer be observable. The mixture of ammonium carbonate and sulphon-amide is extracted with water and dried. If the sulphon-amide is not pure white it should be recrystallized from hot water.

4. PREPARATION OF THE DICHLORAMIDE.

The toluol para sulphon-amide is dissolved in ten parts of 1 : 10 caustic soda (39° Be.) and diluted with twenty parts of water. The solution is filtered through glass wool and then through double filter paper. This removes iron hydroxid from the strongly caustic solution.

Chlorine gas from a cylinder is then passed through the solution, cooled externally by ice, until a voluminous white precipitate of toluol p. sulphon-dichloramide is formed. This is filtered off, thoroughly washed twice with 5–8 parts of water and finally with enough 10 per cent. alcohol to make a thin paste. The dilute alcohol washing should be done very quickly and the substance filtered off with aid of a vacuum filter. It is then dried at a temperature not exceeding 55° C. in a vacuum dryer.

The method has the advantage that it is very rapid and avoids the use of chloroform as a solvent. It was developed in order to produce a dichloramin T. which would be comparatively stable. The product has a negligible ash and a good chlorine content, but no free chlorine on standing.

Calculated Cl = 21.54 per cent., Found Cl = 21.42 per cent.; 21.37 per cent.

The very considerable work done in the chemical laboratory of the Institute on the preparation and distribution of dichloramin T. for surgical purposes has suggested the following specifications as most suitable for this material when used as a disinfectant.

PHYSICAL PROPERTIES.

White powder or crystals with slight yellow green tinge. Melting Point 78–84° C.

CHEMICAL PROPERTIES.

Soluble in cold chloroform with slight to no turbidity. (Any turbidity must be removable by shaking with anhydrous calcium chloride.) Soluble in prepared eucalyptol Dakin and chlorinated eucalyptol 1.2. Ash: not over .2 per cent.; chlorine content, 29.0 per cent. to 29.54 per cent.; calculated Cl 29.54 per cent.

The solubility in chloroform or similar organic solvent is important in that it shows presence of inorganic impurities, calcium salts, etc. Material should not have strong odor of chlorine, showing instability. The melting point may vary within the limits indicated owing to moisture. Sharp drying will decompose the substance.

SOLVENTS.

The eucalyptol, as first proposed[4] by Dakin and Dunham, was chlorinated with potassium chlorate and hydrochloric acid according to the following method:

Five hundred Cc. eucalyptol (U. S. P.) are treated with 15 Gm. potassium chlorate and 50 Cc. concentrated hydrochloric acid. After twelve hours the oil is well washed with water and sodium carbonate solution. Dry sodium carbonate is added to the oil and the mixture is allowed to stand twenty-four hours. It is then filtered and dried with a little calcium chloride.

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[4] Dakin and Dunham, *British Medical Journal,* June, 1917.

This method has the disadvantage that no definite amount of chlorine enters the eucalyptol. The chlorination depends on the rate of adding chlorate and hydrochloric acid as well as the light in which the process takes place. Samples may have 1 per cent. chlorine present or scarcely any, depending on whether chlorination took place in sunlight or on a dark day. The specific gravity of this oil may vary from .930 to .935.

PREPARATION OF CHLORINATED EUCALYPTOL 1.2.

It was found that by passing chlorine gas from a cylinder into eucalyptol the reaction proceeded much further than by the chlorate method described above. When a specific gravity of 1.20 was reached a comparatively heavy oil, much less volatile than eucalyptol, was obtained.

The results of the use of this oil are well known to-day; briefly, it was found that it is almost as good a solvent for dichloramin T., that it can be used in full strength on the skin and in open wounds and that the use of paraffin oil either as a diluent or as a means of preventing sticking of dressings is unnecessary.

The following is a sufficiently detailed statement of the method by which this oil is obtained:

Through a glass tube reaching to the bottom of a five-gallon bottle containing about 10 kilos of eucalyptol is passed chlorine from a cylinder. The oil should have a boiling point of 176–177° C. and a specific gravity of .925 to start. The process should be carried on in good daylight.

During the chlorination the temperature rises and should be kept below 80° C. by regulating the chlorine stream. Hydrochloric acid is given off and may be absorbed in alkali.

When a specific gravity of 1.19 is reached the oil is chlorinated sufficiently and the process is interrupted. The oil is then washed with about four liters of water, then shaken thoroughly with 250 Gm. dry sodium carbonate and allowed to settle. After carefully decanting from the carbonate, about 500 Gm. fused calcium chloride are added and the whole again shaken. On standing, preferably over night, the oil is filtered, bottled and is then ready for use. It is a white or slightly amber-colored oil, specific gravity 1.2, with a chlorine content of about 31 per cent. Such an oil will readily dissolve 20 per cent. of dichloramin T. which solution may keep in an amber bottle without decomposition for a month.

FURTHER PRODUCTS OF CHLORINATION.

By the further chlorination of the 1.2 oil products may be obtained having a specific gravity of 1.5 and higher. This may be carried out by chlorinating directly at 100° C. or with a solvent such as chloroform at its boiling point. The oil of specific gravity 1.4 is amber colored and of the consistency of molasses. The dichloramin is still soluble, although to a less extent. The future may find a use for this type of oil, since the increased viscosity presents an advantage in certain cases.

Dichloramin T. prepared as given above is freely soluble in chlorinated eucalyptol 1.2.

The solutions should be prepared about as follows:

PREPARATION OF 7½ PER CENT. SOLUTION.

Measure off 150 Cc. of oil into a dry brown bottle, preferably one with a glass stopper. Add to this 11.5 grams powdered dichloramin T. This will dissolve, if shaken occasionally, in about an hour. It should *not* be warmed. This makes a 7½ per cent. solution, and is used for all dressings subsequent to the first two or three. This solution should keep for two weeks at least. If this is used in an atomizer, as directed, it has been found that one filling of the usual atomizer reservoir will dress from 100 to 150 cases.

PREPARATION OF 20 PER CENT. SOLUTION.

This solution should be made up about 25 Cc. at a time, using 5 Gm. of dichloramin T. to 25 Cc. of oil. It is most quickly accomplished by trituration and should be kept in a brown bottle. This is applied to fresh wounds and for the first treatment of infected wounds and focal infections. It is most conveniently applied with an ordinary medicine dropper. This solution is good until a crop of fine crystals appears in it, which may happen in three days, although it may last for ten days or more.

When using the solution in an atomizer, the reservoir of which is of white glass, it should be kept in the dark whenever possible and never exposed to sunlight. Light greatly accelerates the decomposition of dichloramin T. in solution. The following points should receive consideration in its clinical use.

1. Surgical asepsis, as perfect as possible, should be used at both the primary operation and subsequent dressings.

2. At the primary operation all wound surfaces should be covered and all crevices filled with the 20 per cent. solution. Subsequent dressings are made with the 7½ per cent. solution.

3. Before the oil is applied the surfaces of the wound should be as dry as possible; free from blood and water.

4. Drainage should be avoided in all wounds closed by suture.

5. It has been suggested that with local infections, such as boils, carbuncles and abscesses, an incision made somewhat earlier than usual with the free application of the 20 per cent. solution of dichloramin T. will frequently sharply limit the progress of the infection.

6. This preparation is essentially non-irritating unless confined by unduly heavy or impervious dressings. If so confined, it may blister.

In conclusion I wish to acknowledge the coöperation of Drs. P.A. Lewis and W. E. Lee, and also the chemical assistance of Miss Elizabeth Hill.

December 4, 1917.

THE USE OF HYDROFLUORIC ACID IN THE GLASS INDUSTRY.

By John Gleichman.

For polishing lead, potash, soda and lime glass, hydrofluoric acid of 60 per cent. strength is necessary. There is no set formula for treating the glass, all attending successes depending largely upon the temperature at which the acid is used, *i. e.,* 90° F. This temperature should not be exceeded, on account of melting the wax, which acts as a coating and protects that part of the blank not to be polished.

Lead or Potash Glass.—The best results are obtained by preparing the dipping acid in a lead water rim tank surrounded by water bath—90° F. To the hydrofluoric acid continue to add oil vitriol gradually until contact is obtained: a white coating, referred to as mud (silico fluoride), forms, indicating that the acid solution is ready for use. Its operation depends entirely with the dipper as to the required number of immersions (1, 2 or 3)—one dip of 12/15 seconds in newly prepared acid in some instances gives satisfaction, but better results are obtained from a three-dip process of 5 seconds each, to be increased from time to time as the acid weakens.

Spent Acid is that acid which, after a day's work of 5/6 hours, is reduced from 60 per cent. to 30 per cent., which can be carried over each succeeding day by means of drawing off the acid in a reserve tank, avoiding the possibility of conflict with the mud which deposits at the bottom of tank—the stronger acid can be added to the weaker until contact is obtained; by this method you establish a means of unceasing use without waste of a single pound of material.

Soda Glass.—This is inclined to be more or less brittle and requires careful treatment—to one just starting in to acquire a good polish precaution is necessary in the beginning until the operation completely satisfies the dipper. We would, therefore, advise that a mixture of 2 parts hydrofluoric acid and 1 part oil vitriol be used in 5 separate dips as follows: 5, 8, 10, 12, 14 seconds each, and by this means one can be governed by their own judgment by decreasing the number of dips to 2 of from 20/25 seconds each. Care must be taken in each instance to not only allow of a good drainage, but the glass must be thoroughly dry before being placed in each successive dip, otherwise it will run and leave blistered and blurred imperfections.

Polish.—It is the aim of every cutting shop to establish the best possible polish: this can be had by treating the glass as already described—but by preparing the dipping acid the night preceding the day's work, gives the acid an opportunity of mellowing by means of proper diffusion—a well-provided hood covering the tank is essential in order to prevent the escape of gas.

The Pop.—In the acid so frequently referred to by the dipper, all depends upon the manner of care devoted to its proper keeping. It so frequently occurs that carboys containing acid are allowed to remain at the freight station or in the outer yard when the temperature is below freezing—cold weather contracts and when the stopper is removed, the pop is lacking, all due to neglect of the operator. Acid should at all times be kept in a warm place, under which conditions best possible service is obtained.

Lead Fluoride is that deposit which sometimes settles at bottom of carboy, which when agitated drifts into the dipping tank and adheres to the glass, causing much inconvenience; care, therefore, should be exercised in having the acid, which, if at times cloudy, can be allowed to settle and poured off clear—thus avoiding additional labor, and possibly an additional dip or two.

Lime Glass.—A mixture of three parts of oil of vitriol and one part hydrofluoric acid 60 per cent. Begin operation with four successive short dips of from 2, 3, 4 and 5 seconds each. Lime glass differs from lead glass in being less uniform, which means that better results are obtainable when atmosphere is clear and dry. Cloudy and inclement weather sometimes blurs the glass, due to the acid's affinity for moisture. This can be obviated, however, by adding hydrofluoric acid in gradually increased quantities.

Bloedite Glass.—A mixture of equal parts hydrofluoric acid 60 per cent. and oil of vitriol. Begin by giving the glass a first dip of only one second. The reason for this is to clear the surface so as to better enable you to make a finished job. Unless this is done the acid clings to the glass and becomes smoky and sticky. Then proceed with successive dips of 3, 5 and 8 seconds each, and, if not quite clear, another short dip of 3 seconds. The glass should be well drained before each dip.

Lead and Manganese Glass without Potash.—For this use a mixture 7 parts hydrofluoric acid and 2 parts oil vitriol. First dip 20 seconds; then three successive dips of 10 seconds each.

Spent Hydrofluoric Acid.—Best incorporated with new hydrofluoric acid as follows, and corresponding with the above dip by mixing:

6 parts spent hydrofluoric,
6 parts hydrofluoric 60 per cent.,
1 part oil vitriol.

Fumed Glass.—Due to improper mixture of dipping acid. This difficulty overcome by using pumice brush and pumice buff afterwards on the plain metal, and thereafter re-dip.

Formula for Stamping.—2 parts hydrofluoric acid, by weight, to 1 part carbonate ammonia, by weight, using sufficient sulphate barytes to thicken so as to make a paste. This paste can be spread on a pad and applied with a rubber stamp. Either 48 per cent. or 52 per cent. hydrofluoric acid should be used—48 per cent. for lead glass and 52 per cent. for lime glass. This stamping acid should be made up in small quantities only as it will not keep any length of time.

DIGITALIS THERAPY AND THE PRESENT SHORTAGE IN DRUGS.[1]

By Robert A. Hatcher, M.D.,

Professor of Pharmacology and Materia Medica, Cornell University Medical College, New York.

The following brief review of the present status of the materia medica of the digitalis group and its relation to therapeutics has been prepared at the request of Prof. Julius Stieglitz, chairman of a committee on synthetic drugs, appointed by the National Research Council, because of the present want of many preparations of this group that have come into more or less widespread use.

All of the members of this group, including many crude drugs and their galenic preparations, as well as glucosidal active principles, exert a qualitatively similar therapeutic action on the heart when they are brought into the blood stream; but the various members of the group vary enormously in their activity and in the rate of their absorption from the alimentary tract.

These differences in behavior of the different members of the group have resulted in the development of faith in one or the other of the numerous preparations and specialties, and a corresponding distrust of all others on the part of those physicians who have not appreciated the importance of dosage and the several methods of administration best suited to the individual preparation in securing the results aimed at. Those who are thus left without the preparation to which they are accustomed feel the want keenly, and the present discussion is designed to point the way to relief from these conditions.

Digitalis, digitoxin, strophanthus, strophanthin and ouabain exert the same kind of action on the heart directly, and on the circulation indirectly, as previously stated in different words; but the action of digitalis and its most active principle, digitoxin, is far more lasting than that of the others. It is necessary to caution the reader against confusing "actions" and "effects" in this connection.

When an attack of acute cardiac dilatation is relieved by any member of the group whatever, the effect is permanent, provided the cause of the failure is not continuously active; but in various forms of chronic cardiac disease which require more or less continuous digitalis medication, the duration of effect and the duration of action are nearly the same. In such cases the duration of action and effect of digitalis and digitoxin are far greater than those of the other members of the group, in which case the difference is overcome by increased frequency of dosage, or, what amounts to the same thing, a relatively—not actually—larger dose of equal frequency.

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[1] Reprinted from the *Journal of the American Medical Association.*

Digipuratum is one of those specialties that have come into wide use partly through their intrinsic value, but mainly because of a most persistent and effective campaign of adroit advertising, and it may be taken as an example of the specialties on which all too many clinicians have come to fix their sole reliance in digitalis therapy. It is certainly true, however, that while digipuratum, like many other specialties, exerts a satisfactory cardiac action, it is in no way essential, since exactly the same actions can be induced by official members of the group in the hands of any one who masters the really simple technic of administration.

In all cases requiring digitalis therapy, digitalis itself in the form of the powder, the tincture, fluidextract, extract or infusion may be used orally with the sole exception of those relatively rare cases in which immediate relief is imperative, and which require intravenous or intramuscular administration. In such cases the typical digitalis action can be induced immediately by the intramuscular or intravenous injection of strophanthin or crystalline ouabain (so-called crystalline strophanthin, not true crystalline Kombé strophanthin, which is not commercially available).

It is necessary to call attention again to the difference between an immediate action and immediate effect, because it has long been taught, without a particle of real evidence, that the action of digitalis cannot be induced promptly. The whole range of digitalis action up to the maximum, that is, cardiac stoppage, can be induced within from five to fifteen seconds by the intravenous injection of digitalis tincture, deprived of its alcohol, or digitoxin. This simple experiment disposes forever of the mischievous claim that digitalis action is slow. The *effect* of therapeutic doses is *gradually* induced; the *action* is *immediate*. A bullet fired through the heart *acts* instantaneously; the *effect* is a fatal hemorrhage, the rapidity of which depends largely on the size of the wound. With suitable dosage, digitalis exerts its action in much less time than was formerly believed to be possible.

The action of an intravenous dose of strophanthin or ouabain is not so lasting as is that of a corresponding dose of digipuratum, but it lasts until it can be supplemented by the oral administration of digitalis.

Another fallacy that dies hard is that digitalis and digitoxin act on the vessels and cause high blood pressure, and that they are therefore contraindicated in cases in which the blood pressure is already high. This has been the greatest stumbling block in the way of the use of digitalis, next to that of regulation of dosage. Every one of the digitalis bodies acts on the vessels when enormous doses are passed directly into them, but this action is never induced by therapeutic doses. The contrary belief rests on the observation of the effects of massive doses in animal experimentation, and is not supported by any careful clinical observations or experiments with therapeutic doses.

Among the less important fallacies that have severally contributed to the distrust of digitalis and have been utilized by manufacturers to their own advantage, the following may be mentioned briefly: All drugs, preparations and active principles of this group without exception cause nausea and vomiting in overdoses through their action on the vomiting center in the medulla—not through any direct action on the stomach; hence it cannot be avoided by any mere change in the mode of administration, or mere choice of preparation, but only by proper regulation of the dosage—and by dosage I mean the amount which actually enters the blood stream and which alone can act on the heart.

None of the drugs of this group are actively diuretic through any direct action on the kidneys. They induce diuresis solely through an improved circulation. That does not mean either a higher or a lower blood pressure in every case; it means a more effective circulation, one better adapted to the needs of the individual patient. This sometimes means an increase, sometimes a decrease, in pressure.

All digitalis galenicals, tincture, infusion, extract and fluidextract, exert the same kind of action, because they all contain all of the active principles of the drug.

All digitalis bodies without exception have the disadvantage of being absorbed somewhat slowly and irregularly from the alimentary tract. Digitalis tincture, as well as the infusion and fluidextract, are absorbed *fairly* promptly; strophanthus and strophanthin, ouabain, convallaria preparations, apocynum preparations, and wahoo are absorbed very irregularly. This is of prime importance, because it requires the administration of large doses of these drugs in order to insure the therapeutic effects; but rapid absorption occurs occasionally under conditions that are not understood, and severe, or even fatal, poisoning may result. The latter drugs should never be used for oral administration.

There is no difficulty in getting standardized digitalis preparations, and these do not deteriorate rapidly. Slight deterioration is not important, because the drug must always be given until a definite action is induced, and this varies with every patient; since there is no fixed dose that is applicable to different patients.

Tincture of digitalis contains only traces of fat, and that is no more disturbing to the stomach than an equal amount of other fixed oils or fats.

Granted that a correct diagnosis has been made, digitalis therapy becomes largely a matter of correct dosage, including the proper method of administration, which is nearly always oral. It is beyond the scope of this paper to consider dosage and methods of administration in detail, the present purpose being to point out to the clinician the resources that he has at his command; but he will find valuable suggestions in the following papers:

"A Clinical Study of Crystalline Strophanthin," by Harold C. Bailey.[2] In this paper the author reports most careful clinical observations with crystalline ouabain, formerly called crystalline strophanthin.

"The Toxic Actions of Digitalis on the Heart," by the same author.[3] This is an excellent study of the toxic actions of digitalis that frequently escape attention.

"Digitalis Dosage," by Cary Eggleston.[4] This is perhaps the best recent study of the method of administering digitalis whereby prompt effects are induced after oral administration.

Fraenkel and others have published numerous papers dealing with the intravenous administration of strophanthin.

I am well aware that many readers will be inclined to deny many statements made in this brief article, but I can only assert that they are based on careful clinical and experimental observations and are not contradicted by any recent careful studies.

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[2] *Jour. Pharmacol. and Exper. Therap.*, 1909, 1, 359.

[3] *Am. Jour. Med. Sc.*, 1911, p. 1.

[4] *Arch. Int. Med.*, July, 1915, p. 1.

ISOLATION OF TETANUS TOXIN.[1]

Heretofore tetanus toxin and other toxins as well as ferments have defied the efforts to isolate them from the mixtures in which they naturally occur. For this reason we know little of the real nature and chemical structure of these remarkable substances; but a way to progress seems to have been found, as London and his co-workers in the Institute for Experimental Medicine in Petrograd now report that under certain conditions tetanus toxin and pancreatic ferments may be carried down on colloidal particles. They find that by the addition of 17 per cent. of ammonium sulphate to culture fluids in which tetanus bacilli have been growing; by centrifugation, the resulting sediment being thrown away; and then by the addition of from 1 to 3 per cent. more of ammonium sulphate, a sediment is obtained which contains the tetanus toxin. This sediment may be dried in vacuum and rinsed repeatedly with ammonium sulphate without thereby reducing the toxicity of the toxin, as minute a quantity as 0.00000002 Gm. being fatal for white mice in two days after subcutaneous injection. They also report that by a similar treatment of pancreatic juice with 20 per cent. ammonium sulphate, the amylolytic ferment may be secured in what looks like a practically pure form, while with 30 per cent. the proteolytic ferment, and with 50 per cent. the lipolytic ferments are carried down. These remarkable results indicate that under certain conditions, which vary in each case, tetanus toxin and pancreatic ferments attach themselves to particles and thus become obtainable in nearly pure form. This discovery may mark a long step in advance in the study of toxins and ferments in general, the same principles no doubt being applicable to many other toxins and ferments than those mentioned.

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[1] Reprinted from *The Journal of the American Medical Association.*

DILUTING FLUID FOR COUNTING BLOOD CORPUSCLES.[1]

JACOB DINER, MD., NEW YORK.

The need of a good diluting fluid for the purpose of counting blood corpuscles has often been impressed on me while working in the laboratory and in hospitals. Those mentioned in textbooks have many drawbacks. Some form a precipitate on standing; others while remaining clear do not permit of the addition of staining solutions so that the white corpuscles may be differentiated from the red corpuscles while making the count; still others destroy the red corpuscles if the diluted blood is permitted to remain in the counting pipette for some hours.

With the object in view of securing a fluid which will do away with the objections mentioned, I have done some work along this line and have obtained what I believe to be an ideal diluting fluid. This fluid permits of a simultaneous counting of white and red corpuscles; it keeps indefinitely without precipitating; it retains the normal shape of the corpuscles, and the diluted blood kept in the diluting pipette for over a week was as perfect as when first drawn. The formula is as follows:

Sodium chloride	0.85	gm.
Sodium citrate	2.00	gm.
Azure II	0.001	gm.
Formaldehyde solution, U. S. P.	3	drops.
Distilled water enough to make	100	c.c.

The sodium salts are dissolved in the water, the formaldehyde solution is added, the azure is added, and it is shaken well. It may be kept in any kind of a bottle.

The technic of using it is the same as with Toison's, Hayem's or any other fluid. The findings are computed according to the degree of dilution.

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[1] Reprinted from *The Journal of the American Medical Association.*

THE DETECTION OF BLOOD IN THE URINE, FECAL MATTER AND PATHOLOGICAL LIQUIDS.

Thevenon, pharmacist aide-major, and Rolland, pharmacist auxiliary of the laboratory of the Military Hospital, Chambrey, propose a new procedure for the detection of blood in secretions and pathological liquids, based on the reaction with pyramidon in the presence of oxidants, the reaction being manifested by a violet coloration.

The reagents employed are:

1. Pyramidon	2.5 Gm.
Alcohol, 90 per cent	50 Cc.
2. Glacial acetic acid	1 Cc.
Distilled water	2 Cc.

3. Solution of hydrogen dioxide of 12 volumes.

The mode of procedure for the detection of blood in urine is to take 3 or 4 Cc. of the unfiltered urine and an equal volume of the alcoholic pyramidon solution and 6 or 8 drops of the acetic acid solution; after agitating the mixture add 5 or 6 drops of the hydrogen dioxide solution.

In accordance with the quantity of the blood in the urine the coloration appears more or less rapidly; if there is produced immediately an intense violet lilac the blood present is abundant

The reaction usually takes place in about a quarter of an hour if there is present even traces of blood; the blue-violet tint attains a maximum intensity and then gradually disappears.

For the examination of fecal matter, a small quantity of the fecal matter is rubbed up with 3 or 4 Cc. of distilled water and filtered, the filtrate is then mixed with the pyramidin and acetic acid reagents and then 6 drops of the solution of hydrogen dioxide is added. In the presence of blood, the blue-violet coloration is observed and this is more or less intense according to the amount of blood present.

For the detection of blood in gastric juice or in various pathological liquids the same technique is followed.

Concurrent experiments made with the Meyer reagent and with the proposed test gave in all cases the same result. The authors claim that the pyramidon test is as sensitive and delicate as that of Meyer and that it is very simple and rapid and that because of the conservation of time and the definite results obtained it will prove serviceable in the clinical examination for blood in the different liquids of the organism.—Translation from *Annales des Falsifications et des Fraudes.*

G. M. B.

TREATMENT OF CORKS USED IN SOXHLET AND OTHER EXTRACTION APPARATUS.[1]

By T. J. Ward.

The difficulties which arise from the porosity of cork and the solubility of certain constituents of cork when used in extraction apparatus may be overcome in the following manner: Gelatin is soaked in cold water for five or six hours, the unabsorbed water poured off, and the gelatin warmed gently until it is melted, when one quarter of the volume of glycerol and two volumes of water are added.

The corks, which have previously been softened and bored, are completely immersed in the glycerol-jelly solution contained in a covered beaker, and heated on a boiling water-bath for two hours. They are then removed, the whole of the surface wiped with a cloth, the corks dried in a warm place for a few hours, and then used in a Soxhlet extraction apparatus for one hour.

Corks treated in this manner may be safely exposed to the vapour of ether, petroleum ether, benzene, carbon disulphide, and chloroform, but must not be used with solvents in the vapour of which water and glycerol are readily soluble.

The corks should be stored at the ordinary temperature away from any source of heat, as a warm, dry atmosphere causes them to shrink and harden.

Four corks, two of which were very porous, treated in the manner described, were used to connect the flask, Soxhlet extractor, and condenser, in a series of ether extractions. The jelly was then completely removed with hot water and the corks dried at the ordinary temperature, after which a further series of extractions was made. The extraction in all cases lasted for one hour.

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[1] Reprinted from *The Analyst.*

The following results were obtained:

		Mgrms. of Ether-soluble Matter extracted	
	Extraction.	Corks A and B (very porous).	Corks C and D.
After treatment with glycerol jelly..	1	5	1
	2	0	0
	3	0	0
	4	0	0
After removal of glycerol jelly	5	13	7
	6	10	3
	7	7	9
	8	7	6
	9	8	5
	10	6	3

DISTILLATION OF GERANIUM OIL IN INDIA.[1]

In a recent issue the *Indian* (Government) *Trade Journal* quotes from a note on the distillation of geranium oil in the Nilgiris prepared by the chemical adviser to the Forest Research Institute at Dehra Dun, in which it is stated:

The note is written for the information of those interested in the development of the essential-oil industry in the Nilgiris, to show that the cultivation of geranium would in all probability lead to good results, especially as its distillation could be combined with that of eucalyptus oil without incurring any additional expenditure.

True geranium oil is distilled from the fresh herb of several species of *Pelargonium,* chiefly *Pelargonium odoratissimum, P. capitatum,* and *P. roseum.* (The plant collected by the writer has been identified for him as *Pelargonium graveolens* L'Herit.) The geranium plants cultivated and used for distillation are generally varieties of these species which, however, do not correspond exactly with the wild plants. Ducellier states that the plant is cultivated in open fields in many parts of Algeria. It is also largely cultivated in the south of France, in Spain, in Italy, Corsica, Réunion and in Provence.

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[1] Commerce Reports.

The oil occurs mainly in the flowers and in the green leaves. The stem, the leaves which have turned yellow, and other parts of the plant have no oil in them. The plants are gathered just before the opening of the flowers when the citron-like aroma begins to change into a rose-like scent. The whole plant is put into the still. Sometimes the distillers, in order to make the aroma finer, add a small quantity of rose petals, the distillate of oil from which is commercially known as rose-geranium.

The yield of oil is stated to vary with the locality and with the varieties used for distillation. The leaves of *P. odoratissimum* yield in France from 0.1 to 0.2 per cent. and in Corsica 0.125 to 0.166 per cent.; in Réunion the leaves of *P. capitatum* give 0.1 to 0.14 per cent. of oil. In Italy, it is stated, by careful distillation the flowers once gave 1.5 to 1.98 per cent. and the leaves 0.7 to 0.8 per cent. In Sicily, on the other hand, only 0.07 per cent. was obtained. The major portion of the geranium oil of commerce comes from Africa and Réunion.

The main constituent of the oil is geraniol, but citronellol is also present. In addition to the free alcohols, tiglic acid esters, together with small quantities of caproic acid esters, are also present. Traces of acetic. butyric, and valeric acids have also been detected. The oil has 60 to 70 per cent. of the geraniol and 15 to 25 per cent. combined geraniol in the form of esters. Schimmel & Co. report the presence of linalool, one of the amyl alcohols, pinene, and phellandrene. Pure geranium oil is soluble in three times its volume of 70 per cent. alcohol, which is a very reliable test for the detection of turpentine and fatty oils.

The geranium is propagated in Algeria by cuttings, but it is not necessary to renew the plantations every year, as is done in the south of France, for the climate of Algeria is rather warmer and the plants are therefore not killed by frost in the winter. It is said that in Mitidja the plant sometimes attains an age of twelve years. It often happens that the plant is in leaf throughout the year, but there are occasions in Algeria also when the geranium plantations suffer severely from frost. In the South of France the pelargonia are treated as annuals; that is to say, every spring the fields are planted with fresh cuttings, which have been collected during the autumn and left to winter in protected spots. In the south of France there is only one crop yearly—in the autumn; but in Algeria three crops are gathered every year. In the south of France it is necessary to have recourse to intensive culture by irrigation and rich manuring in order to make the single crop pay. In Algeria the flowers are cut for the first time in early spring; the second cutting is in June; and the third, if any, in October and November.

Five hundred pounds of the plant, consisting of the entire stem with leaves and flowers, containing 56 per cent. of moisture, were distilled. Only 3.5 ounces, or 0.044 per cent., of water-free filtered oil were obtained. Considering the season in which the plant was collected the yield was satisfactory, and it will be safe to assume that the Nilgiri geranium is normal in its oil-content. Further experiments on these lines must, however, be made before we can be said to have got full and sufficient data on the subject, and this can only be done if the cultivation of the plant is taken in hand.

It is recommended that its cultivation be encouraged in the Nilgiris as an auxiliary crop for the use of eucalyptus distillers. The climate of Ootacamund is well suited for its cultivation. The Nilgiri plant yields an oil of excellent aroma, having 46.60 per cent. of free geraniol and 28.19 per cent. of combined geraniol, for which a sale can be readily found even in India.

THE CHEMISTRY OF THE DUBOISIAS.[1]

The plants which are classified by botanists in the family Solanaceæ frequently contain substances possessed of powerful pharmacological qualities. Mention may be made of the mydriatic alkaloids of the atropine group and the active principles of the nicotine series. The number of substances classified in the atropine group was at one time numerous, but better methods of purification have led to the separation of some uncommon bodies into two or more well-known alkaloids. The chief members of this group are hyoscyamine, scopolamine and nor-hyoscyamine.

Hyoscyamine is an optically active alkaloid, of which the lævo-variety occurs naturally. This optical isomer is powerfully mydriatic. Atropine is the racemic form of this substance, and is readily made by shaking the lævo-variety with a little alkali. Such atropine as is separated from plants is believed to be due to the racemization of 1-hyoscyamine during the isolation of the alkaloids. The dexter-isomer has been prepared synthetically, and is devoid of mydriatic properties. Atropine has about one half of the activity of the lævo-isomer on the eye, as it is made up of equal parts of the two isomers. Scopolamine, which is known commercially as hyoscine, is also an optically active substance. The natural variety is lævo-rotary, while the inactive form is readily prepared by racemization. The lævo-variety is more powerful pharmacologically than the dextro form.

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[1] *Medical Journal of Australia.*

Nor-hyoscyamine is chemically isomeric with hyoscyamine, but differs from it in the arrangement of certain groups. The name nor-hyoscyamine was given by Merck, and solandrine was given by Dr. J. M. Petrie, who isolated this alkaloid from *Solandra lævis*. Its pharmacological action has not been described, but experiments made in the University of Sydney show that it behaves like atropine.

Among the plants of the Solanaceæ growing in Australia are three species of *Duboisia*. *Duboisia myoporoides* is an evergreen tree, ranging through the coastal district of eastern Australia from Cape York to the Shoalhaven River. In 1877 Bancroft, of Brisbane, published an account of the action of aqueous extracts of the leaves of this tree. He paid much attention to the mydriatic properties of these extracts, which were used in ophthalmic practice in Brisbane. Bancroft took several pounds of the extract to England in 1878. Gerrard separated the alkaloid in a purer state from this material, and concluded that it differed from atropine. Ringer and Murell observed the dilatation of the pupil of the eye, the arrest of the perspiration, the antagonism to muscarine, the production of tetanus in frogs and the onset of headache and of drowsiness in man. They believed the new alkaloid to be different from atropine. Ladenburg obtained the crystalline gold chloride of hyoscyamine and from a commercial sample of duboisine sulphate. Some years later, from another sample, Ladenburg prepared the gold salt of scopolamine. In 1892 E. Merck isolated a new alkaloid, which he named pseudo-hyoscyamine. In 1912 Carr and Reynolds obtained from *D. myoporoides* 1.1 per cent. of hyoscyamine and 0.15 per cent. of nor-hyoscyamine identical with pseudo-hyoscyamine. Dr. J. M. Petrie recently examined a sample of duboisine sulphate belonging to the physiological laboratory of the University of Sydney. It yielded 1-hyoscyamine, 1-scopolamine and nor-hyoscyamine.

In 1860 Baron von Mueller described *Duboisia hopwoodii* from specimens brought back from the Burke and Wills expedition. Bancroft obtained in 1872 samples of the "pituri," which was used by the aborigines of the interior as an intoxicant. Mueller and Bailey identified "pituri" with *Duboisia hopwoodii* in 1876. Langley and Dickenson in 1878 showed that pituri was closely similar to nicotine in its physiological properties. Gerrard isolated the alkaloid, and named it piturine. Petit, of Paris, in 1879, identified piturine with nicotine. Professor Liversidge examined the alkaloid a year later, and concluded that it differed from nicotine in the amount of nitrogen present. In 1910, however, the late Dr. Rothera, of Melbourne, proved conclusively that piturine was identical with nicotine.

In 1867 Mueller described *Duboisia leichardtii* from material supplied by the explorer Leichhardt. This plant is a Queensland species, growing in the area between that occupied by *D. myoporoides* on the coast and by *C. hopwoodii* in the center of Australia. Dr. J. M. Petrie has found the fresh leaves to contain 0.28 per cent. of mixed alkaloids. From half a gramme of mixed alkaloids he has separated 0.1 Gm. 1-hyoscyamine, 0.1 Gr. 1-scopolamine, and 0.2 Gm. nor-hyoscyamine. Now that accurate information is available as to the distribution of these valuable medicinal substances in native trees, it is to be hoped that chemical enterpise and manufacturing ability will bring about the supply of these substances to the medical profession and to the public from Australian soures.

INDIAN FOREST PRODUCTS.[1]

Mr. R. S. Troup, assistant inspector-general of forests, has written a very useful and interesting pamphlet on the work of the Forest Department of India, in which he describes in a popular manner the main facts connected with the development of forest products generally. After dealing with the history, area, classes, and types of forests, research organization, etc., Mr. Troup passes on to a description of the forest products themselves, these including gums, resins, barks, leaves, fruits, fibers, etc., all of which fall under the head of "minor produce." The timber-trees are, of course, "major produce," and a paragraph is devoted to each of the principal, the following being typical of those of interest to the drug-trade:

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[1] Reprinted from *The Chemist and Druggist.*

Acacia Catechu Willd.—The cutch-tree. A moderate-sized to a large tree, common in most of the drier parts of India and Burma; grows gregariously on the shingly and sandy beds of streams in the sub-Himalayan tract. . . . Cutch and kath are obtained by boiling down chips of the heartwood. Supply largely utilized, especially in Burma.

Acacia arabica Willd.—Babul. A moderate-sized to large tree of the drier parts of the plains of India, chiefly in Sind (on tracts irrigated by the Indus), the plains of the Punjab and United Provinces, and the Indian Peninsula generally. . . . Bark used for tanning, pods for cattle-fodder and tanning; also yields a gum. Present supplies generally fully utilized; heavily worked since the outbreak of war for the tanning industry.

Dipterocarpus turbinatus Gaertn. f. Gurjan.—A very large evergreen tree of Burma, the Andamans, Chittagong, and Cachar. . . . The tree yields a wood-oil known as gurjun oil.

Pterocarpus Marsupium Roxb.—The gum-kino tree, bijasal. A large tree of central and southern India, extending north to Oudh and the Kumaun Bhabar. Wood yellowish brown, with darker streaks, very hard, durable; used for door and window frames, posts, beams, furniture, agricultural implements, wheels, carts, boats, and many other purposes. The wood when damp is apt to produce a yellow stain. The tree yields a red astringent medical gum known as "kino" from wounds in the bark. Fairly fully utilized where accessible.

Santalum album Linn.—Sandalwood. A small tree of the India peninsula from the Nasik and Nagar districts southwards, particularly in Mysore, Coorg, and some of the Madras districts—N. Coimbatore, N. Arcot, N. Salem, Bellary, and the Nilgiris. The heartwood is yellowish brown, hard, very close-grained, and strongly scented; it is used for carving and fancy work of all kinds, and is burned as incense, while sandalwood oil is distilled from it. Volume for volume, this is by far the most valuable wood in India; it is sold by weight, and every portion of the tree which yields heartwood of any size is utilized, the heartwood from the roots being the most valuable. Fully utilized.

The forests of India are so rich in minor products of all kinds that only those of proved commercial value are dealt with by Mr. Troup. As regards oil-seeds it is interesting to note that the best known obtained from any Indian tree is that of the mohwa, *Bassia latifolia,* which is used in India primarily for adulterating ghee, besides being exported to Europe in large quantities; thus, in 1913-14 the total exports amounted to 665,979 Cwt., valued at 364,000 l., of which quite 95 per cent. found its way to Germany, but since the war much of the trade has been diverted to England via Bombay. Many of the forest oil-seeds are utilized to a large extent as food and for cooking in India, but as a rule the seeds collected from trees scattered over large areas do not compete with oil-seeds cultivated as agricultural crops, and their collection is only commercially remunerative if they possess special properties, *e. g.*:

The seeds of Taraktogenos Kurzii yield the true chaulmugra oil of commerce . . . the tree is fairly common in Assam, the seeds being exported from the Khasi Hills and sold in Sunamganj. It is also common in the Sylhet and Sibsagar divisions of that Province, while considerable quantities are available from the Rangoon and Shwegyin divisions of Burma. A very similar oil, which is also a variety of chaulmugra oil, is obtained from the seed of *Hydnocarpus Wightiana,* which is found in the forests of the West Coast, especially in South Malabar and in the Cochin and Travancore States.

The forests of India are rich in undeveloped tanning materials, and there is unquestionably a great opportunity for technical research as well as for industrial and commercial development. The study of tanning materials is being steadily prosecuted at the Forest Research Institute, and with the object of inquiring into the commercial possibilities of preparing tan and extracts, the government of India have recently secured the services of a tanning expert from England. Among those described are myrabolans, babul bark and pods, mangrove-barks, *Cassia auriculata* (the standard tan-bark of southern India), leaf tans or sumach, cutch, etc. Among the essential oils described by Mr. Troup prominence is given to sandalwood, rosha (east Indian geranium or palmarosa oil), and lemongrass. There is nothing new to be said about sandalwood, except that the hope is expressed that " the time is not far distant when the whole output of sandalwood required for distillation-purposes will be distilled in India by modern methods, and not exported for distillation abroad." In regard to palmarosa oil, which was dealt with in the C. & D. of July 14, 1916 (p. 787), recent investigations have shown that improvements in distillation can be effected by employing a modern type of steam still, and that by distilling the grass with steam 20 per cent. more oil can be obtained. In regard to wintergreen oil, Mr. Puran Singh, chemical adviser at the Forest Research Institute, is believed to have been the first to show that the oil can be distilled at a profit in India from the leaves of *Gaultheria fragrantissima* collected in Assam during the winter, the fresh leaves giving as much as 0.65 per cent. of oil, or 1.2 per cent. calculated on the dry material. Naturally Mr. Troup gives a detailed account of the Indian pine-resin industry, to which much attention has been devoted of late years, and, judging from his remarks, there is no doubt that eventually India will be able to supply the greater part of her own markets with rosin and turpentine oil.

THE MANUFACTURE OF ANTHRAQUINONE.[1]

There is a growing feeling that our American color industry should promptly enter upon the manufacture of alizarin and the other important dyes derived from anthraquinone. In this connection we reproduce from *La Revue Produits Chimiques* a full account of the current process, now employed in Europe, for transforming the hydrocarbon anthracene into anthraquinone:

By oxidation anthracene yields anthraquinone according to the equation:

$$C_{14}H_{10} + 3O = C_{14}H_8O_2 + H_2O.$$

As this oxidation is effected industrially by means of chromic acid it may be formulated as follows:

$$C_{14}H_{10} + Na_2Cr_2O_7 + 4H_2SO_4 = C_{14}H_8O_2 + Cr_2(SO_4)_3 + Na_2SO_4 + 5H_2O.$$

It is performed in large wooden vats, lined with lead, holding 10 to 12 cubic meters. The vats are heated with direct steam and furnished with agitators. A vat is charged wtih sublimed anthracene, still in form of paste. The charge is 150 kilos of anthracene to

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[1] Reprinted from *The Chemical Engineer.*

3,000 to 4,000 liters of water. The temperature is raised to 75° C., and, with constant stirring, 2,000 liters of a chromic solution, containing 100 grammes of chromic acid and 250 to 300 grammes of sulphuric acid at 66° Bé. per liter, are added gradually. The 2,000 liters, therefore, contain 300 kilos of bichromate of soda and 600 kilos of sulphuric acid. During the operation the temperature gradually reaches 95° C.

The oxidation is carried on for twelve to sixteen hours, and does not present any particular difficulties. The chromic acid must not be added too quickly, and the solution must not be too concentrated. Otherwise a persistent and troublesome foam is produced. The reaction is controlled, from time to time, by testing samples. A sample is filtered, washed, then sublimed over the naked flame in a small test-tube, and, with a little practice, it is easy to see if the anthraquinone is pure or whether, on the other hand, there is still anthracene present. The anthraquinone sublimes in fine needles, whereas anthracene forms silvery scales, easily recognizable.

It will be seen by the proportions given that the bichromate is employed in excess; 200 kilos of bichromate, theoretically, should be able to oxidize 175 kilos of 95 per cent. anthracene.

When the oxidation is terminated the contents of the vat are forced by a pump through a filter press, in which the anthraquinone is thoroughly washed. If the anthracene used is sufficiently pure, the yield is about 110 per cent. of anthraquinone.

The anthraquinone thus obtained is sublimed by steam in an apparatus similar to that used for anthracene. On the sublimation the weight is reduced; the theoretical 117 per cent. falls to about 80 to 85 per cent.

Formerly, when non-purified anthracene was oxidized, the anthraquinone obtained was very impure, and had to be treated with two or three times its weight of sulphuric acid (66° Bé.) at 100° C., until a sample poured into water gave an almost white precipitate. By this treatment the impurities became soluble in water, whereas the anthraquinone, being insoluble, could be separated out. Since purified anthracenes have been obtainable, this operation has disappeared, sublimation alone being generally sufficient to bring the anthraquinone to a sufficiently pure state for ordinary purposes. The sulphuric acid treatment is still resorted to, however, in the rare cases when an extremely pure anthraquinone is required.

Anthraquinone forms yellow crystals. In a finely divided state it is almost white. The fusing point is 284.6° C., the boiling point 382° C. It sublimes very easily. It is completely insoluble in water, slightly soluble in alcohol, ether, and benzene in the cold, rather more soluble with heat in benzene and in glacial acetic acid.

It is not a commercial product. Apart from a limited use as catalyzer in certain sulphoxylate discharges, it is employed solely in the color works.

It is interesting to note that it may be synthesized without using anthracene as the point of departure. Phthalic acid is condensed with benzene in the presence of chloride of aluminum. This gives orthobenzoyl-benzoic acid. By anhydrization with hot concentrated sulphuric acid this gives anthraquinone. The reaction is so simple that its industrial application has been considered. As a matter of fact, although it has not been used for anthraquinone itself, it is employed in the synthesis of different derivatives of anthraquinone.

A very important factor in the economy of anthraquinone manufacture is the regeneration of the chrome, which, after oxidation, is in the state of chromic sulphate. This can be crystallized and recovered in the form of chrome alum, after the addition of the necessary quantity of sulphate of potassium or of sulphate of ammonium, as the ammonia alum crystallizes as well as the potash salt.

The high price of chrome alum, which is very largely used at the tanneries, makes the recovery of importance. An annual production of 300 tons of anthraquinone nearly corresponds with the French consumption, and in the manufacture 1,500 tons of chrome alum are obtained.

Another way is to precipitate the chromic sulphate with soda, which gives chromium hydroxide used in the preparation of chromium acetate, chromium fluoride, and other salts used in the textile industries. In the German works the chromic acid is recovered by electrolysis, which is by far the most economical way where the electric current is cheap.

USES.

Except for certain special purposes, anthraquinone serves almost solely as the raw material for the anthraquinone colors, of which alizarin is the most important. By sulphonation, nitration, chlorination, and other processes nitro-anthraquinone, sulpho-anthraquinone, chloro-anthraquinone, amido-anthraquinone, etc., are prepared, and these serve as intermediaries for the manufacture of a large variety of valued dyes.

CHARLES H. LAWALL, PH.M.

President-Elect of the American Pharmaceutical Association.

Charles H. LaWall, associate professor of theory and practice of pharmacy in the Philadelphia College of Pharmacy, has been elected president of the American Pharmaceutical Association for the year 1918–1919.

Charles Herbert LaWall was born at Allentown, Pa., on May 7, 1871. His father was John J. LaWall, likewise a druggist, and who for some years had a store in that city.

In 1876 John J. LaWall accepted a responsible position with the drug firm of Moyer Brothers, engaged in the retail, jobbing and manufacturing of pharmaceuticals at Bloomsburg, Columbia County, Pa., and his family was removed to that locality.

The early education of Charles H. LaWall was obtained in the public schools and in the Bloomsburg State Normal School. In the latter his instruction embraced physics, chemistry, higher mathematics, including trigonometry, Latin, and German. In July, 1888, he engaged with the firm of Moyer Brothers to learn the drug business, and served with them an apprenticeship of three years.

He came to Philadelphia and matriculated as a student in the Philadelphia College of Pharmacy in September, 1891, and was graduated in 1893.

While attending the college, he was in the employ of Smith, Kline & French Co. After graduating he was engaged for some time in a retail store in Atlantic City. In 1894, he returned to Philadelphia and accepted a position in the analytical department of Smith, Kline & French Co.

He has been a close student, a keen observer, an accurate investigator, always making the best of his opportunities and assiduously enlarging the scope of his work and broadening his influence. He has taken a lively interest in the state and national pharmaceutical associations, and his numerous contributions to the literature of pharmacy prove that his pen, as well as his intellect, has

Charles Hallowell

been kept busy. Despite these activities along chemical and pharmaceutical lines, he has found time to take up the practical study of systematic botany and his recreation has been found in numerous botanical excursions and as a result he is well informed upon the local flora.

Professor LaWall has devoted his energy largely to the study of practical assaying, and now enjoys an established reputation as practical chemist. In 1903, he became associated with Dr. Henry Leffmann in analytical work in his laboratory, and has since acquired the business and succeeded Doctor Leffmann in commercial work. In August, 1904, he was appointed chemist to the Department of Agriculture of Pennsylvania, which position he has since continuously held. As a chemist for that state he has made numerous examinations and exposed many frauds and adulterations in foods and drugs. In April, 1907, he was appointed as inspection chemist of the United States Department of Agriculture having charge of the examinations of drugs coming into the port of Philadelphia.

In addition to his many papers contributed to the journals, Professor LaWall was associated with Doctor Leffmann in the publication of a text-book on organic chemistry which appeared in 1905.

He received the degree of Master in Pharmacy in course from the Philadelphia College of Pharmacy in 1905, and the same year, was made associate professor of theory and practice of pharmacy in this college.

EXEMPTION OF CHEMISTS FROM MILITARY DUTY.[1]

In the inevitable haste required to organize the selection of the great army of American youth, now in training, and soon to be found on the firing line in Europe, we have not adequately profited from the experience of England and France. There, also, in 1914 was seen the same hurry to bring together, with the least possible delay, every man capable or willing to carry a rifle. Ere long it was recognized that the engineer, the electrician, the chemist, and others of high scientific training could render far greater service to the cause of national defense at home than in the trenches.

Then came the period, unfortunately after many had fallen, when they were gradually summoned back to deal with a multiplicity of problems of prime importance. Chemists in particular were required to handle all the questions involved in assuring an enormous output of explosives of every form, in combating the use of gases in warfare, in establishing the manufacture of drugs and general chemicals formerly secured from the enemy and in producing rapidly a host of articles essential for modern warfare.

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[1] Reprinted from *The Chemical Engineer.*

On this side of the ocean there has been a tardy issue of regulations, exempting medical students and hospital internes. There has been, however, no action tending to free chemists from the action of the draft and save to the most vital industries of the land the men whose knowledge and training, now or later, will be of incalculable value for national defense or for preserving the integrity of our industrial fabric.

Dr. Wm. H. Nichols, chairman of the Committee on Chemicals of the National Research Council, has given this matter much thought in connection with his colleagues. At the recent meeting in Boston of the American Chemical Society he made the following forcible statement in depicting the activities of his committee:

"One of our most serious difficulties arises from the unwillingness of the military authorities to recognize the wisdom of exempting chemists as a class from the draft. Almost from the beginning of our work we took up this question from various angles, realizing as we do the vital importance of keeping chemists at work in their profession, not only at the present time, but more particularly for the future. Our civil, mechanical, electrical and other engineers can be made good use of at the front, and not only contribute greatly to the success of our forces, but by the valuable experience obtained in their profession can improve themselves for future service at home. This is not true of chemists, with an exception here and there. Once in the army and at the front, if he be only recently out of college, he is lost to chemistry forever. They are not slackers and are just as anxious as any other red-blooded young men to get into the fray, and therefore I have believed it wise not only to have them exempted from the draft but declined in case they should enlist. Already serious trouble has come to many of our chemical plants and plants employing chemists, as a result of the draft, and unless wise provision be soon made we can foresee a condition which it will cost months to rectify. Why should we not take advantage of the experience of our English friends who have passed through this same situation, and learned that there is a large class of men who can do more valuable work behind the lines than they can in the trenches?"

MEETING OF THE NATIONAL PHARMACEUTICAL SERVICE ASSOCIATION.

Three hundred and forty-five new members were added to the roll of the National Pharmaceutical Service Association at its seventh monthly meeting held at the Philadelphia College of Pharmacy, Tuesday evening, December 11.

Dr. Henry P. Hynson of Baltimore, who had been invited to speak on the organization of a Pharmaceutical Corps in the Army, stated that there were two ways open to pharmacists for securing such a corps. One was to induce the medical profession and the Surgeon-General's office to favor such a measure, and the other was to have a bill similar to the Edmonds Bill passed by Congress over the head of the Surgeon-General. Dr. Hynson told of his connection with the Rotary Clubs and of the coöperation that could be afforded the movement for the passage of the Edmonds Bill by Rotarian pharmacists. Dr. Hynson said that he would make it his first "order of business" to secure the coöperation of Rotary Clubs throughout the United States in behalf of the Edmonds Bill. He also mentioned the desirability of having the support of the National Drug Trade Conference in pushing this measure through Congress.

Mr. Caswell A. Mayo, of New York, who had also been invited to speak on the Edmonds Bill, made a very interesting address based on his experiences in the various camps which he has had an opportunity to visit. He declared that it was absolutely necessary for the welfare of our Army to have adequate pharmaceutical service and urged that subscriptions be asked for so as to swell the funds of the N. P. S. A. sufficiently to be able to carry on an active propaganda in behalf of the measure. It was moved, seconded and carried that the secretary send out letters asking for contributions for this work and it was also decided that the Executive Committee be instructed to prepare literature telling of the work of the N. P. S. A.

Upon motion by Dr. Eberle it was decided to ask the National Drug Trade Conference and other associations for their active co-operation in this work.

A hearty vote of thanks was given Mr. Mayo and Dr. Hynson for their attendance at the meeting and for the messages which they had brought.

DEATH OF KENNETH HAY.

The first reported death of a student of the Philadelphia College of Pharmacy, who in this war has entered the service of his country, is that of Kenneth Hay, son of the late Charles F. Hay, of Dubois, Pa., a prominent Pennsylvania pharmacist. Kenneth Hay matriculated in the College in 1916, shortly after the death of his father, and sustained the additional loss of his mother shortly after entering College.

When war was declared with Germany, Mr. Hay enlisted as an orderly in Base Hospital No. 10, sent by the Pennsylvania Hospital of Philadelphia. His death was reported in one of Gen. Pershing's official casualty lists for November, the cause ascribed being appendicitis and pneumonia.

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

Citric Acid Fermentation of Aspergillus Niger.—In the citric acid fermentation of sucrose by *Aspergillus niger* the mycelium floats on the surface of the substratum and wrinkles up in such a manner as to present a very large surface of contact. These wrinkled structures often project 5–6 Cm. into the medium and exhaustion of the substratum proceeds under very favorable circumstances. By a judicious selection of cultures and conditions the yield of citric acid can be varied from nil to over 50 per cent. of the sugar consumed. Conditions especially favorable to citric-acid formation are low nitrogen supply, high concentration of sugar, and the use of ammonium salts instead of nitrates. As regards the reaction of the medium, the hydrogen-ion concentration is a far more important factor than the titratable acidity. For a given hydrogen-ion concentration (p^h) a mineral acid, such as hydrochloric, is less toxic than an organic acid. The addition of calcium carbonate is disadvantageous rather than helpful; the cultures readily produce a solution of 10 per cent. citric acid and the limiting hydrogen-ion concentration is exceptionally high. Fermentation can be started at a hydrogen-ion concentration, which will greatly reduce the chance of infection without interfering with the growth. Higher yields in a shorter time are obtained without calcium carbonate than with it, as the carbonate partially precipitates the magnesium and phosphate nutrients; moreover the formation of calcium citrate is a hindrance in recovering the citric acid. It is possible to ferment two or three batches of medium in succession with the same mycelial felt by draining off the liquid and running in a fresh batch. The most suitable medium for conducting the citric acid fermentation has the following approximate composition per liter: Sucrose, 125–150 Gms.; ammonium nitrate, 2.0–2.5; potassium dihydrogen phosphate, 0.75–1.0; crystallized magnesium sulphate, 0.20–0.25 Gm.; hydrochloric acid to $p^h = 3.4–3.5$ (5–4 Cc. of $N/5$ acid). The use of this quantity of hydrochloric acid makes it possible to sterilize the liquid completely by steaming at atmospheric pressure for 30 mins. and prevents subsequent infection without interfering with the fermentation. In a medium of this nature there is little development of acid in the first 2 or 3 days; when a vigorous mycelium has developed the rise in acidity is very rapid—about 2 per cent. in twenty-four hours—until the seventh or eighth day. After remaining constant for 2 or 3 days the acidity begins to decline. In a proper fermentation the fungus does not produce spores but remains white. Under favorable conditions the acidity will reach 10–12 per cent. on the eighth day; oxalic acid may amount to 3–4 per cent. of the total acidity. Fermentation may be carried out successfully in shallow pans and the liquid pressed out from the mycelium in a filter-press. (Through *Journal of the Society of Chemical Industry.*)

COMPARISON OF METHODS FOR THE ESTIMATION OF GLYCYRRHIZIN IN LIQUORICE ROOT AND IN SUCCUS LIQUIRITIÆ.—It is only within the last ten years that the importance has been emphasized, rightly, of estimating, in addition to the glycyrrhizin, the amount of sugar, in order that adulteration of a liquorice with sugar may be detected. Since the amount of glycyrrhizic acid (glycyrrhizin) varies between wide limits, not only in different kinds of liquorice, but even in one and the same kind at different times, the author used always the same liquorice throughout his series of comparative experiments on the trustworthiness of the twenty-seven methods proposed for the estimation of glycyrrhizic acid. In any method, attention must be given to the following points: (1) The influence of the liquid employed as a solvent of the liquorice; (2) the nature of the acid used as the precipitant; (3) the solubility of glycyrrhizic acid in water and in the precipitant, and the loss caused thereby; and (4) the purity of the glycyrrhizic acid when brought to the stage of weighing. All the methods are criticized from these four points of view, and the author draws the conclusion that no one of them is really trustworthy, mainly on account of the impossibility of isolating the glycyrrhizic acid in a pure state. Details are given of a method proposed by the author, which, although tedious and not strictly trustworthy, is less inaccurate than any other previously brought forward. A tabulated list of the literature on the subject from 1808 to 1913 is given, together with a classified list of the results obtained by the twenty-eight methods discussed in the paper. (A. Linz, *Arch. Pharm.,* 1916, 254, 65–134, 204–224, through *J. Chem. Soc.,* 1917, 112, II, 430–431, and reprinted from *The Analyst.*)

SOLUBILITY OF CALCIUM CARBONATE IN BOILING WATER.—Various statements have been published of the solubility of calcium carbonate in water at 100° C., as, for example, 0.111 Gm. (Fresenius), 0.143 Gm. (Pollacci), 0.034 Gm. (Hofmann), and 0.036 Gm. (Weltzien) per liter. The author's experiments show that this discrepancy is due to the fact that calcium carbonate is slowly dissociated by boiling water, with the loss of carbon dioxide. For this reason it is not possible to obtain a solution containing only calcium carbonate in boiling water. This dissocation does not continue indefinitely, and may be checked by adding to the boiling water in which the calcium carbonate is suspended about 15 Cc. of a solution of lime (saturated at the ordinary temperature). The substance found in the solution after long-continued boiling of calcium carbonate with water consists almost entirely of free lime. Apart from the duration of boiling, other factors which have an influence upon the proportion of free lime which dissolves are the volume of the liquid and the concentration of the solution. The addition of a small quantity of sodium carbonate prevents the dissociation and the solution of calcium carbonate in boiling water. Advantage may be taken of this in estimating calcium in the form of carbonate. The precipitate is washed with boiling water containing 0.05 Gm. of anhydrous sodium carbonate per liter. It is then treated with standard hydrochloric acid until completely dissolved, and the excess of acid titrated with standard sodium hydroxide solution, with methyl orange as indicator. The error due to the sodium carbonate solution retained by the precipitate (about 2 Cc.) is negligible. Calcium carbonate produced by chemical reactions in aqueous solutions at low temperatures forms supersaturated solutions, the stability of which depends mainly upon the concentration and the temperature. (A. Cavazzi, *Gazz. Chim. Ital.*, 1917, 47, 49–63. Reprinted from *The Analyst.*)

PURE BISMUTH.—The determination of minute traces of impurity in bismuth is difficult, since the basic salts form amorphous precipitates which obstinately retain other metals, as also do the sulphide and oxide. The electrolytic method of separation also fails. The best means of obtaining the pure metal is by crystallizing the normal nitrate from strong nitric acid. Fairly pure bismuth nitrate is dissolved in half its weight of 8 per cent. nitric acid, and the solution mixed with an equal weight of the strong acid. The crystals which separate at 0° to 10° C. are washed with ice-cold nitric acid. The pure nitrate is converted into oxide by heating and this is reduced by fusion with potassium cyanide. Further purification is effected by melting the metal under paraffin, and removing, by means of a glass spoon, the first, and purest, crystals formed. Purified bismuth melts at 271° C., and when pressed into wire the melting point is lowered to 195° C., and its specified electrical resistance is then 1.20. Various samples of bismuth sold as pure were found to contain from 0.03 to 0.25 per cent. of impurities. The method for testing for impurities is detailed. (F. Mylius and E. Groschuff, *Zeit. Anacq. Chem.*, 1916, 96, 237, through *J. Chem. Soc.,* 1917, 112, (3), 37.)

Biochemical Reaction to Differentiate Pyrocatechol, Hydroquinone and Resorcinol.—The reaction is based on the property of the enzyme laccase of developing a blue color with certain phenols in presence of free hydriodic acid and starch. The reaction occurs in two phases. In the first loss of phenolic hydrogen occurs as the result of oxidation. In the second, much more sensitive, the hydriodic acid is reduced, deprived of its hydrogen, and iodine is liberated. The reagents necessary are: (1) 1:50 solution of soluble starch, containing 3:100 of potassium iodide; (2) glycerin maceration of *Russula delica* 1:1, or other fungus rich in laccase. A little of this is filtered through cotton wool when required. On adding 2 drops of this to 2 Cc. of a 1:1,000 solution of pyrocatechol, then 5 drops of the starch solution, followed by 1 to 3 drops of a 6:100 solution of acetic acid, an intense blue color is gradually produced. On repeating the test with a similar solution of hydroquinone no reaction occurs. But, on substituting a 4.9:100 solution of sulphuric acid for the acetic acid, a blue color will gradually appear. With resorcinol, under similar conditions, a negative reaction is obtained with either acid. The reaction, therefore, serves easily to distinguish these three isomeric diphenols. (J. Wolff, *Annales de Chim. Analyt.*, 1917, 22, 105, through *The Pharmaceutical Journal and Pharmacist.*)

The Chemical Structure of Nucleic Acid.—The bustle of a busy world, particularly in war time, is likely to leave us oblivious to the beauty or the importance of happenings which do not show on the surface their direct application to everyday affairs. Yet even a brief consideration of the fundamentals of such modern necessities as the dynamo, the wireless, the coal tar dyes or the antiseptics, will carry us back to the little heralded research of some quiet investigation in a modest laboratory. In a spirit of dutiful recognition of important contributions of this sort we cannot refrain from reference to a series of investigations on the chemical structure of the nucleic acids, culminating in recent papers from the laboratory of physiologic chemistry at the Johns Hopkins University. To the biologist the nucleic acids are familiar as integral components of every nucleated cell in living beings; to the physician they further recall the purins, which play a part in the genesis of uric acid. Recent studies have definitely indicated that there are two distinct types of nucleic acids, one of which is found in animal tissues and the other in plants. Our knowledge of plant nucleic acids has been acquired from the study of products from two sources; the wheat embryo and yeast. It has now been ascertained that these plant nucleic acids are probably identical. They are composed of four mononucleotids (compounds of a nitrogenous substance either a purin or a pyrimidin, a carbohydrate and phosphoric acid) joined together through their carbohydrate groups. The details of such chemical structure would probably interest most of our readers as little as the intricacies of modern experimentation in the science of immunology on which much useful serum therapy has been based. No one will gainsay, however, that the unraveling of the structure of a compound represented by the empiric formula $C_{38}H_{55}N_{15}O_{29}P_4$ is no mean accomplishment. And to associate this splendid labor largely with the names of American investigators—Osborne, Wheeler, Johnson, Levene, Jacobs, Jones and others—lends a national pride to the accomplishment. (*The Journal of the American Medical Association.*)

DANDELION ROOT ADULTERANT.—Examination of samples of importations of "dandelion root," *Taraxacum officinale* Weber, has disclosed that in some instances roots obtained from a Lactuca species, very probably *Lactuca canadensis* L., or *Lactuca spicata* (Lam.) Hitchc., have been substituted for the true material. The root of *Taraxacum officinale* may be distinguished by the concentrically arranged groups of laticiferous vessels and sieve tubes, which alternate with whitish inulin-bearing parenchyma. *Lactuca* root is characterized by its trachæ which are arranged in radial rows, usually one cell wide, alternating with medullary rays two or three cells wide. The department will recommend the exclusion from the United States of any shipment labeled "dandelion root," consisting wholly or in part of roots of *Lactuca* species. (*U. S. Department of Agriculture.*)

FENNEL ADULTERANT.—Examination of samples of "fennel seed," *Fœniculum vulgare* Miller, has disclosed that bitter fennel, *Fœniculum piperitum* Sweet, has been substituted in some instances for the true material. This species is not cultivated and may be distinguished from *Fœniculum vulgare* by its very much smaller size and the decidedly bitter taste and flavor of its volatile oil. The department will recommend the exclusion from the United States of any shipment labeled "fennel seed," consisting wholly or in part of bitter fennel. (*U. S. Department of Agriculture.*)

BIEBRICH SCARLET AS A STAIN.—Dr. A. Knyvett Gordon, of Virol Research Laboratories, writes to the *British Medical Journal* to point out the advantages of Biebrich scarlet as a plasma-stain. He states that in routine histological work it is customary and advantageous to use a "contrast" stain after the nuclei of the cells have been defined by hæmatoxylin or (in the case of chronic or sublimate-hardened material) by methylene blue. For this purpose eosin is commonly employed, but it has two disadvantages: (1) It not infrequently extracts the color from the previously stained nuclei; and (2) it colors everything else with the same intensity. Benzopurpurin is free from these drawbacks, but it is useless in weak solution, and in adequate concentration is apt to stain very unevenly and to deposit gelatinous flakes in portions of the section. Picrorubin (Van Gieson's stain), picroerythrosin, and similar preparations have the grave disadvantage of discharging the color almost completely from the nuclei after the preparation has been mounted for a short period. Biebrich scarlet is soluble in water freely, and is best used in 1 per cent. solution. It never overstains, and does not discharge the color from the nuclei. Most sections are stained sufficiently in two to five minutes. It does not wash out in alcohol, clove oil, cedarwood oil, or xylol. Its chief advantage, however, is the fact that it stains different tissues with varying degrees of shade and tint. Muscle, for instance, is stained a yellowish-brown, and the protoplasm of young epithelial cells a bluish-pink, while the older keratinized cells are bright scarlet. In an epitheliona, for instance, the degree of pressure to which the epithelial cells have been subjected, which is a valuable guide to the rate of growth of the tumor, is well differentiated. Used after methylene blue for tissues that have been fixed in Flemming's or Zenker's fluid, it does not discharge the nuclear stain. The staining is of marked permanency. He adds that the dye is now being made by British Dyes, Ltd. (*From The Chemist and Druggist.*)

COMMERCIAL AND TRADE INTEREST.

Aden's Exports of Senna Leaves to United States.—Among the exports to the United States for the second quarter of the calendar year 1917, declared at the Aden consulate, those of senna leaves take a more prominent place than ever before in the history of American trade with Aden.

The local article of commerce known as senna consists of the leaves of some species of *Cassia* which grow wild in several parts of this commercial district. It is used for medicinal purposes. The native name is "senna makki." The supply in the Aden market consists chiefly of two kinds of grades, known as "Yemeni" and "Jibuti."

The Yemeni grade is much the better and comes to Aden from the Yemen and other Red Sea Arabian Provinces, while the second grade is collected in Abyssinia and French Somaliland, and is shipped from Jibuti to Aden.

Senna reaches Aden in large bales weighing from 12 to 16 maunds each (a maund is 28 pounds). Recent prices for the uncleaned senna have been 5 rupees and 8 annas ($1.78) per maund for the Yemeni, and 1 rupee less (a rupee equals $0.3244) per maund for the Jibuti grade. These prices are approximately 2 rupees higher than the normal figures.

The senna is cleaned in Aden. Indian women are employed to pick it over and throw out twigs, discolored leaves, etc. Leaves of other plants which resemble the senna leaves are often mixed with it in the districts of production to increase the weight. Considerable skill, therefore, is said to be needed by the women who do the cleaning, in order to find and throw out these foreign leaves. If rain falls while the senna is being sundried in the districts of production, the dried leaf turns black, and these also must be removed when the senna is cleaned for export. An uncleaned bale often gives less than half a bale of cleaned and picked product fit for foreign markets.

Only recently has it become an article of export to Europe and to the United States, although small quantities occasionally have gone to Egypt and to India. During the past 15 months a demand has developed in the United States, and the first exports of senna recorded at this consulate were shipped during the second quarter of 1916, when 31,273 pounds, valued at $7,946, were sent to American importers. During the third quarter of 1916, a small amount, valued at $1,613, went to the United States. The next shipments were made during the second quarter of the current year, and they amounted to 82,868 pounds, valued at $42,407. During this quarter senna leaves ranked next to skins in the value of Aden exports to the United States. American importers apparently are paying fancy prices for the product.

The total exports of all commodities to the United States during the second quarter of the current year reached a value of $869,609, which is about 70 per cent. of the total value of the exports during the first quarter of this year.—Consul Addison E. Southard, Aden, Arabia, July 2. (From Simmons's "Spice Mill.")

Peanut-Oil Manufacture in United States.—According to information collected during June, 1917, by the Bureau of the Census coöperating with the Bureau of Chemistry of the U. S. Department of Agriculture, there were fifty mills in the United States making peanut oil. During 1916, these mills produced over twenty-six million pounds, or about three and a half million gallons of peanut oil. In addition to this there was imported a little over two million gallons, making the total consumption of peanut oil in this country over five million gallons.

Abroad, practically all the edible peanut oils are made by pressing cold the shelled nuts, only the residue from these cold pressing being cooked and hot pressed. The third or fourth grades thus obtained generally have been used for technical purposes. In the

United States the tendency has been to treat peanuts the same as cotton-seed with the result that practically all the oil produced required refining or a least deodorizing before it was suitable for salad and cooking purposes. There is no reason why a large part of our domestic peanut oil should not be made from sound, shelled stock pressed in such a way as to yield a virgin oil which would be ready for household use when simply filtered to remove press sediment. At the present time there are mills willing to make this high-grade virgin oil if they can obtain a steady market at a price slightly above what is paid for the crude hot pressed oil. As in refining there is a loss of about 5 per cent., every hundred gallons of virgin oil produced means a saving of five gallons of food oil, which would otherwise go into soap stock. At this time of increasing scarcity of edible oils it is of vital importance to save at every point possible and if those who are in a position to create a market for this virgin peanut oil, which is generally considered superior to the refined article, will get in touch with the producers so that they will be assured of a demand for their product. The Bureau of Chemistry has a list of the mills that contemplate crushing peanuts this season and will be glad to coöperate with the wholesale grocery trade by supplying it with the addresses of firms in a position to furnish virgin peanut oil. (From Simmons's "Spice Mill.")

MEDICAL AND PHARMACEUTICAL.

The Carrel-Dakin Treatment of Wounds.—A committee appointed by the director-general of the British Army Medical Services for the purpose of investigating and reporting on the Carrel-Dakin treatment of wounds has made its report (*British Medical Journal,* 1917, 2, 597). The hospitals visited were Carrel's, which at the time of the visit was under the surgical care of Guillot; the clinics of Tuffier and Churto in Paris; the American Ambulance in Paris, and Mrs. Depew's Hospital at Annel. In Carrel's, Tuffier's and Chutro's clinics, only Dakin's fluid is used. In the Annel Hospital, three fluids are used with Carrel's tubes—Dakin's fluid, eusol and ether. The committee was assured that good results were obtained from each of them. The committee points out that it is evident that in estimating the value of the Carrel-Dakin treatment, care must be taken to appraise quite separately the method of applying the antiseptic and the antiseptic employed. While convinced that the use of Carrel's tubes, as the committee saw them employed, is a very valuable means of applying an antiseptic fluid to a wound, the committee is not satisfied that Dakin's fluid is markedly superior to eusol, and was prepared to find that other antiseptics can be used with advantage by the Carrel method.

The results of the Carrel-Dakin treatment, as seen in a large series of unselected cases, were remarkably good. The most striking evidence of the value of the treatment seen by the committee was a printed notice put up in a prominent place in Tuffier's wards, said to be the expression of his own opinion after a considerable experience of the Carrel-Dakin treatment. The notice is as follows:

"Tout blesse qui suppure a le droit d'en demander la raison a son chirurgien" (every patient whose wounds suppurate has the right to demand an explanation of his surgeon).

The committee is of the opinion that the Carrel-Dakin method of treament, if carried out thoroughly, is full of promise, and believes that it will (1) diminish the dangers incidental to sepsis, including secondary hemorrhage; (2) hasten the patient's convalescence; (3) lessen the liability to stiff joints and cicatricial deformities; (4) enable the patients to leave the hospital with better general health than they otherwise might, and that (5) when secondary operations become necessary, these operations are more likely to be free from septic complications than when some other system of primary treatment has been adopted. (From *The Journal of the American Medical Association.*)

ANTITYPHOID VACCINATION AND AGGLUTINATION TEST.—The total number of quantitative tests performed by Rist from February to November, 1915, amounted to 11,648. He found the greatest practical value for diagnosing infection caused by the bacilli of the typhoid group. But when it comes to discriminate between the three subspecies belonging to that group, the information given by the Widal test should be accepted with great caution. A predominance of the agglutination titer of *B. paratyphoid A* or *B* speaks almost certainly in favor of *B. paratyphoid A* or *B*. But if the agglutination titer of *B. typhosus* predominates, the probability of the disease being due to *B. typhosus* is only 73.3 per 100. In individuals having been previously vaccinated against *B. typhosus,* the agglutination test is absolutely unable to confirm a clinical diagnosis of typhoid. The behavior of the agglutination titer in vaccinated typhoid or paratyphoid patients is not distinguishable from the behavior of the same titer in vaccinated individuals suffering from any other disease. In a case of clinically confirmed typhoid occurring in a previously vaccinated individual, the agglutination test has a practical diagnostic value whenever it shows a constant predominance of the agglutination titer for one of the paratyphoid germs. But this is a very rare finding. In the greater majority of cases the agglutinating titer for *B. typhosus* predominates. It has no diagnostic value, the probability of mistaking paratyphoid for typhoid being slight. Blood culture is therefore the only reliable method to ascertain whether a typhoid infection occurring in a vaccinated person is due to *B. typhosus* or to one of the paratyphoid germs. (E. Rist, *Journal of Laboratory and Clinical Medicine, St. Louis.* Reprinted from *The Journal of the American Medical Association.*)

War Wounds Treated with Flavine.—This is the authors' report to the medical research committee. Flavine was tested out by Drummond and McNee clinically as well as in the laboratory. Seventy patients, many having multiple injuries, were treated. The flavine was at first employed in a strength of 1 in 1,000, the dilution being made in normal saline solution, in which the powder is readily soluble. This routine was soon given up, however, as it was found that equally good results ensued if the use of 1 in 1,000 solution for the first dressing was followed by the employment of a solution 1 in 5,000 for all subsequent applications. In some cases, also, where the Carrel method of irrigation was being used, the strength of the solution was further reduced to 1 in 10,000. The surgical methods adopted depended on the type of injury met with. Long incisions, with free excision of damaged muscle and fascia, must be regarded as a cardinal part of all operative treatment in recent wounds, no matter what subsequent methods are employed. After this preliminary surgical treatment the wounds treated with flavine were dealt with in the following ways: (1) Primary suture; (2) drainage by tube or gauze strip, followed by secondary suture; (3) the Carrel method of intermittent irrigation; (4) gauze packing in open wounds. Wounds treated by excision of the infected and damaged tissue, followed by primary suture, gave excellent results.

Secondary suture gave good results in all the cases in which it was adopted. In open wounds on removal of the first dressing on the third day the wound, except for being deeply stained with flavine, has undergone no alteration whatever in its appearance, and resembles an injury only a few hours old. All signs of inflammation are wanting, and there is no pain, redness, swelling, or induration in the tissues around. The secretion from the wound is minimal in amount and suppuration is absent. The complete absence of suppuration, even in wounds where films show abundant organisms to be present, is a noteworthy feature in wounds under treatment with flavine. When dressed again at the end of a week the skin edges are found clean cut, no epithelial growth having taken place from the edges. The floor of the wound has by this time become covered by a closely adherent membrane, only detached with difficulty from the underlying structures. This yellow pellicle forms over whatever tissue is exposed in the wound, whether it be muscle or subcutaneous fat. Experience has shown that a wound heals with much greater rapidity if the flavine be stopped after three or four days in the case of small wounds, and after about a week in the case of severe wounds or compound fracture.

Flavine appears to have many advantages as a primary treatment of recent war wounds. Among the advantages are: (*a*) The absence of all toxicity, even in large wounds. (*b*) The prevention of suppuration and of spreading sepsis. (*c*) The primary dressing need not be changed for two or three days, and is then easily and painlessly removed. This may be of great advantage during severe fighting, where rapid evacuation of wounded from front to base is required without unnecessary dressing of the wounds. (*d*) The wounds are not inflamed and painful, and the surrounding skin is never irritated. Flavine cannot be classed as a success in the treatment of the later stages of war wounds. The wounds tend to assume a stagnant condition, during which the processes of repair are almost in abeyance. After a few days, when the danger of gas gangrene and of spreading sepsis have to a great extent passed off, flavine should be stopped and another treatment adopted. In the majority of cases war wounds are not rendered bacteriologically sterile even by the prolonged use of flavine. Test-tube experiments carried out with organisms isolated from actual wounds bear out the strong antiseptic properties of flavine, and their enhancement in the presence of serum. Coliform bacilli, which are a common infection in the later stages of wounds, are much more resistant to the action of the antiseptic in test-tube experiments than any of the other types of organism examined in this way. (H. Drummond and J. W. McNee, *Lancet.* Reprinted from *The Journal of the American Medical Association.*)

BOOK REVIEWS.

Qualitative Chemical Analysis, Henry W. Schimpf, Ph.G., M.C., Professor of Analytical Chemistry in the Brooklyn College of Pharmacy. Third edition, Revised. ix + 187 pages, 6 × 9. Cloth, $1.50 net. John Wiley and Sons, Inc., New York, 1917.

In his preface the author states that he is "encouraged to publish a new and revised edition" because of the "exhaustion of the second edition of this book and the greatly increased demand for it"—a statement which one can well believe after having examined the book even only superficially.

The subject matter is considered under three heads:

Part I. Definitions and General Considerations,
Part II. Identification and Separation of Inorganic Bases and Acids,
Part III. Qualitative Analysis of Organic Substances.

Part I, covering 16 pages, gives in plain, easily understood, language the theoretical information that the student most needs before he begins the actual wrestle in the laboratory with test-tube, filter, funnel and reagent.

Part II treats, first, of the use of apparatus and reagents, then takes up in detail the metals and the more common of the acids, the student being taught how to recognize basic and acidic constituents, first of simple salts, then of mixtures of salts. The reactions are generally illustrated by equations, and reasons are given for each step in any process. Numerous charts are given, generally so plainly worded that the veriest tyro should have but little difficulty in using them intelligently, and even the experienced worker should find them helpful.

Part III treats, first, of the identification of the constituent elements of organic substances, then takes up in turn the use of immiscible solvents, use of Fehling's solution, detection of the more common of the organic compounds of pharmaceutical interest (including alkaloids, glucosides, the official synthetics and the scaled iron compounds), detection of poisons, urinalysis, preparation of reagents. This portion should appeal to the everyday worker who does any chemical testing whatsoever.

The author claims only to have authority to use for comment the U. S. P. VIII, but gives a number of tests based on the U. S. P. IX, giving due credit therefor. The paper and typography of the book are good, but there is abundant evidence of carelessness in proof-reading, an exceptionally large number of errors appearing on its pages. Fortunately, most of them are of minor importance and are so apparent as not to lead the experienced chemist far astray, but some of them might give students, for whom the book is avowedly intended, considerable trouble. On page 52 the equation given under test 83 belongs under test 84, and a correctly written one should appear under test 83; on page 57, section 63, in the second part of Division *B* something has been omitted (probably "add $(NH_4)_2S$"), as Co and Ni chlorides are water-soluble; the last two parts of the same division should read "Solution = Ni" and "Ppt = Mn," to make the statements accord with those given under 27 and 28 on page 58; near the middle of page 117 the word "cuprous" is used where "copious" was probably intended. It seems strange, to say the least, that a newly revised book should take so little cognizance of the work done by chemists during the last thirty years as to limit the number of known elements to "about seventy-four" (page 3), to still consider that acids "are hydroxids of the non-metals" (page 8), and to so carefully omit any reference to the existence of ions and the part they play in analytical reactions. However, the book is well worth a place on the busy chemist's or pharmacist's laboratory table.

F. P. STROUP.

MEDICAL BACTERIOLOGY, by John A. Roddy, M.D., P. Blakiston's Son & Co., Publishers, Philadelphia, Pa. Price, $2.50.

The rapidity with which the modern science of bacteriology has been developed has been such that many of those practicing medicine, veterinary medicine, dentistry and pharmacy are but poorly equipped with a knowledge of this science, which is playing an increasingly important rôle in the diagnosis, cure and prevention of diseases. Bacteriology is likewise now an established adjunct to the work of the chemist and analyst, as many of the chemical problems are so closely interwoven with bacterial study that a working knowledge of bacteriology is essential for the chemist who would solve these.

The specialist in bacteriology may have access to the voluminous studies and works on the subject and to the extensive current literature relating to that science, but the busy practitioner of medicine, the pharmacist and the chemist as a rule can devote but a moderate amount of time to such study. The book now before us fills in an excellent manner the needs of these busy workers for such accurate, up-to-date information on bacteriology as is essential to their needs.

In the 285 pages with the 46 illustrations the author has presented a concise and accurate résumé of bacteriology as relating to medicine. Despite the conciseness, the method of presentation is clear and interesting.

Part I of the book entitled "Medical Bacteriology" occupies 171 pages. Part II, "Bacteriology," in 103 pages discusses a number of subjects such as the examinations of water, milk and eggs, and the determination of the germicidal value of disinfectants which might be considered as in the domain of *technical* bacteriology and in other chapters considers "Diagnosis," "Bacterial Vaccines," "Therapeutic Sera," "The Wassermann Test" and "Immunity." The differentiation in the classification of these subjects, which certainly are medical, is not clear to us.

Of the 49 short chapters included in Part I, 42 of these are devoted to the individual presentation of established types of germs, as for example Chapter VII deals with Staphylococci and Chapter VIII with Streptococci. Each chapter sets forth in paragraphs with titles in boldfaced type the subject matter clearly and this is well supplemented by the illustrations.

In Chapter II, "Classification," the author uses the terms "higher bacteria" and "higher forms of bacteria" for organisms that are not classified as "rod-shaped Schizomycetes" (*bacteria*) or even as belonging to the Schizomycetes, and in a subsequent chapter on "Staining" names as Higher Bacteria, Leptothrices, Cladothrices, Streptothrices, Saccharomycetes and Hyphomycetes. The author has thus laid the foundation for his treatment in subsequent individual chapters of such subjects as molds and yeasts. No fault can be found with the statements in these chapters or with the advisability of including in a handbook for the practitioner such related subjects as are known to be the causes of disease. However, there is here raised the question whether an author in writing on a scientific subject is justified, simply for the convenience of presenting his subject, in setting aside the established botanical and scientific classification of the fungi that differentiates the Saccharomyces, the Zygomyces, the Hyphomyces, the Schizomyces, etc., and jumbling them under a title that is properly limited to only one section of Schizomycetes. Especially so when a modification of the title of his book would have avoided such unscientific methods and criticism.

Not the least valuable are the chapters on Staining, Culture Media and Sterilization. The inclusion in the latter of information on the newer antiseptics, such as the "Dakin Solution," indicates the modern and comprehensive scope of the book.

The book is a valuable aid to the diagnostician and clinician as well as to the laboratory worker in bacteriology and chemistry and should prove to be the handy volume to all of these.

G. M. B.

The Treatment of Emergencies, by Hubley R. Owen, M.D., Chief Surgeon of the Philadelphia Police and Fire Bureaus, etc., etc. 350 pages, W. B. Saunders Co., Publishers, Philadelphia.

Dr. Owen in his preface explains the object of the book. He says: "The book is essentially an enlargement of the lectures delivered to the Training Schools of the Policemen and Firemen of Philadelphia, etc. While collecting data for these lectures I was unable to find a book on First Aid, or the Treatment of Emergencies in which the principles of, and the reasons for, the application of first-aid dressings were fully understood."

The typographical features of the book are excellent, the paper is good and the type clear and distinct. The illustrations, which are a prominent feature of the book, are mostly photographic reproductions, obtained through the coöperation of the police and fire departments. The book is quite up-to-date; for instance, Dr. Owen says: "The war in Europe has upset many of the traditions and teachings concerning wounds produced by military bullets. The military bullet was believed to be humane. It was said that it seldom carried dirt, clothing or other foreign material into the wound, etc. The present war has shattered these beliefs. Modern trench war has profoundly modified the character of military wounds. A large proportion of wounds in the present war are infected, etc. The two most serious forms of infection have been tetanus (lock-jaw) and gas gangrene."

Chapter VII on Asphyxiation is of special value, the subject being treated in a clear and forceful manner, much information being given not obtainable from other sources. Dr. Owen's experience at fires enabling him to treat of smoke asphyxia in all its phases. In Chapter XI effects produced by lightning are treated of more extensively than is usually done in a book of this kind. It is stated that about 224 persons are killed by lightning annually in the United States. Excellent advice is also given regarding the danger of electric currents, and the best way to handle "live wires."

The book would be a valued addition not only to the library of the physician, but also to that of the pharmacist.

C. B. Lowe, M.D.

Joseph T. Remington

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PROFESSOR JOSEPH PRICE REMINGTON.

By Charles H. LaWall, Ph.M.

"He who influences the thought of his time influences the thought of all the time that follows. And he has made his impress upon eternity."

Professor Joseph Price Remington is dead. On January 1, 1918, Atropos severed the thread of a life which has meant much to pharmacy. Clothos' distaff bore the unsullied skein which Lachesis had measured for more than seventy years.

It is difficult, indeed, to correctly estimate the value of a man's services to the world before time has developed the true perspective, but there will be none to challenge the statement that for a period of at least twenty-five years, Professor Joseph P. Remington was the foremost figure in American pharmacy. Genial and eloquent, a keen student of human nature, a lover of the beautiful in art, music and literature, possessed of a fund of scientific knowledge of unusually broad scope, and with it all a consciousness of power that made him an acknowledged leader among men—these are some of the qualities that were combined in him to make a great teacher, a capable executive and a Christian gentleman, clean-minded and clean-hearted.

He was the descendant of early Philadelphia Quaker stock, his ancestors for three generations having been residents of that city and members of the Society of Friends. His father was Dr. Isaac Remington, a well-known Philadelphia physician. His mother was the daughter of John Hart, who was a descendant of Townsend Speakman, an apothecary in Philadelphia early in the eighteenth century, and the sign from this old store was given a prominent place in Professor Remington's private office at the Philadelphia College of Pharmacy.

He inherited a liking and an aptitude for scientific study, and when but a small boy had equipped a chemical laboratory in which most of the apparatus was of his own devising and construction. In the collection at the College is a Liebig condenser made by him at the age of twelve, out of a tin roll-plaster case, two heavy rubber washers and several pieces of glass tubing, which has done service in lecture counter experiments for more than fifty years.

His father died when Joseph Remington was but fifteen years of age. The plans which had been made for him to obtain an academic college degree were abandoned. He received his preliminary education in private schools, and in the Philadelphia Central High School. At the time of his father's death, the members of his family wished him to take up the study of medicine, but he decided that he preferred to study pharmacy instead. It was a decision purely his own and tis wisdom is confirmed by his subsequent brilliant career in the profession of his choice.

January 1, 1863, exactly fifty-five years before the day of his death, he entered the establishment of Charles Ellis, Son & Co., a prominent firm of wholesale and retail druggists of that time in Philadelphia. He was guided in his choice of a preceptor by his brother-in-law, Henry M. Troth, the son of one of the founders of the Philadelphia College of Pharmacy. His experience at the Ellis store covered an unusually wide range, even at that time, for the firm was one that did a great deal of manufacturing on what was then considered a very large scale. He was fortunate in the fact, too, that Mr. Charles Ellis, the head of the firm, and at that time the president of the Philadelphia College of Pharmacy, took a more than ordinary interest in him and encouraged him to attend the lectures at the college during the years of his apprenticeship. The lectures at that time were given in the evenings and the course was of two years' duration. At the commencement exercises held in 1866, Joseph P. Remington was graduated from the institution in whose service he was destined to spend so many useful years and was awarded the degree of Ph.G. Curiously enough and prophetic in its significance, the title of his graduating thesis was "Our Alma Mater, Its Rise and Progress."

In January, 1867, Professor Remington left Philadelphia to enter the employ of Dr. E. R. Squibb, then the foremost manufacturer of chemicals and pharmaceuticals in the United States.

His experience with Dr. Squibb afforded an unusual opportunity for him to amass that fund of technical knowledge which gave him such an advantage over many of his contemporaries who were not similarly favored by fortune. Dr. Squibb's reputation for painstaking and conscientious scientific work and his high standard of ethics were universally conceded and the influence of this period upon Professor Remington's future work must have been very great. He lived as a member of Dr. Squibb's family and was thus brought into close touch with a master in the profession.

After three years of experience under Dr. Squibb he was recalled to Philadelphia by the death of his mother and, remaining in his home town, entered the employ of Powers & Weightman, with whom he remained for two years, during which period he added still further to his practical knowledge of manufacturing operations. While with this firm, in 1871, he first became associated with the Philadelphia College of Pharmacy in an active way, by accepting an invitation to become the assistant to Dr. Edward Parrish, who was at that time Professor of Pharmacy. In 1872 he left the employ of Powers & Weightman to establish himself in the retail drug business at the northeast corner of 13th and Walnut Streets. In this same year, Professor Parrish died and was succeeded by Professor William Procter, Jr., who retained Professor Remington as the assistant in that department.

In 1874 Professor Procter's death occurred and in the spring of that year, Joseph P. Remington was elected to the full professorship in pharmacy, a position held by him for a period of forty-four years, or until his death.

The period from 1874 until 1885 was one of steady development for the young professor. The thirteen years that he remained in active retail drug practice (1872 to 1885) proved him to be possessed of keen business ability as well as professional attainments of a high order. In 1868 he had become a member of the American Pharmaceutical Association and was honored by that body in 1876 by being made chairman of the committee in connection with the famous Centennial Exhibition of 1876, commemorating the hundredth anniversary of American Independence. This was an important post for a young man of twenty-nine years, but he filled it well and paved the way for the future honors which were to come to him at the hands of this Association.

At this period of Professor Remington's life he was a man of quite different personal appearance from that which distinguished him in later years, for he wore a full beard of a reddish-brown color, and one of the most interesting paintings in the valuable collection on the walls of the college museum is one of the Professor Remington at about that time.

In 1874 he married Miss Elizabeth Collins, also of Quaker ancestry, and in the early 80's established a summer home on the then almost unpopulated beach below Atlantic City known as Longport, at which place he did most of his most valuable literary and revision committee work, and took an active part in the growth and development of the Borough.

In 1877 he aided and encouraged the establishment of laboratory instruction in the college and was elected director of the pharmaceutical laboratory in that year.

In 1878 he became one of the organizers and charter members of the Pennsylvania Pharmaceutical Association and in 1879 he became one of the associate editors of the United States Dispensatory, a position held continuously until his death.

In this same year he developed the methods of laboratory teaching in pharmacy which have been so successfully followed in later years by all teachers of pharmacy. The first operative pharmacy laboratory of about 60 desks in the Philadelphia College of Pharmacy was equipped by him at his own expense.

In 1885 he gave up his retail business at 13th and Walnut and purchased the home at 1832 Pine Street, where he lived until his death, except during the summer months, which were spent at Longport. It was in 1885 that his great work, the "Practice of Pharmacy," was first issued. This is probably the most widely known textbook of pharmacy in the world and is now in its sixth edition.

His first connection with pharmacopœial revision work was in 1877, when he was appointed upon an auxiliary committee of revision by the Philadelphia College of Pharmacy. In 1880 he was a member of the United States Pharmacopœial Convention, was chosen as a member of the revision committee and served as first vice-chairman. This honor was again conferred upon him by the Decennial Convention of 1900.

In 1886–7 Professor Remington received his first honors from abroad in his election to Fellowships in the Chemical, Linnæan and

Royal Microscopical Societies of Great Britain. These honors were later succeeded by honorary membership in the Pharmaceutical Society of Great Britain, the British Pharmaceutical Conference, Pharmaceutical Gesellschaft zu St. Petersburg, Instituto Medico Nacional Mexico, Societé de Pharmacie d'Anvers, Societé Royale de Pharmacie de Bruxelles.

He has also been the recipient of many honorary degrees, including Ph.M. of the Philadelphia College of Pharmacy, Phar.D. of the Northwestern University of Chicago. Of American scientific societies he is an honorary member of the College of Pharmacy of the City of New York and of the State Pharmaceutical Associations of New York, New Jersey, New Hampshire, Nebraska, Ohio, Colorado, Virginia, Georgia, Minnesota and others. He was proud of his honorary membership in the New York Deutscher Apotheker Verein and the Chicago Veteran Retail Druggists' Association.

He was an active member of the American Pharmaceutical Association, American Philosophical Society, the American Chemical Society, the American Geographical Society, the Academy of Natural Sciences of Philadelphia, the Historical Society of Pennsylvania, the Philadelphia College of Pharmacy, the Pennsylvania Pharmaceutical Association, the Chemists' Club of New York, and others.

His literary ability brought him recognition in membership in the Franklin Inn Club of Philadelphia and the Authors' Club of London.

He was the official representative of the United States at the Eighth International Pharmaceutical Congress at Brussels in 1896 and in 1913 at the Hague, was a delegate to the Pan-American Medical Congress in 1893 and again in 1896.

In 1893 he was elected dean of the Philadelphia College of Pharmacy, succeeding Prof. John M. Maisch, who died during the summer of that year. This position he held until his death.

In 1893 he had the honor of occupying the presidential chair in the American Pharmaceutical Association, at what was probably the most important meeting in its history up to that time, it being held in Chicago during the World's Fair of that year, and there was held at the same time and place an International Pharmaceutical Conference, over which he also presided.

His influence in shaping the policies and promoting the success of the A. Ph. A. had been shown when in 1887 he elaborated a plan for reorganizing this Association and establishing several of the Sections which have been so valuable in the work of the Association, all of its work having previously been done by the entire body. In 1880 he had aided in the establishment of the council as the governing body of the A. Ph. A., and served as chairman of that important executive body for seven years altogether, some of which were in its earlier period and some later.

In 1896 he was elected president of the Pennsylvania Pharmaceutical Association. In 1897 he became pharmaceutical editor of Lippincott's Medical Dictionary, a standard reference work which has passed through many subsequent editions.

In 1887 he attended the American Medical Association meeting as a delegate from the A. Ph. A. and induced that body to establish a section on materia medica and pharmacy, which later became the Section on Pharmacology and Therapeutics. He was often a delegate from pharmaceutical to medical organizations in later years and has done more than any other single man to promote cordial relations between the professions of medicine and pharmacy.

In 1901 occurred the death of Dr. Charles Rice, then chairman of the U. S. P. revision committee. Professor Remington was first vice-chairman, but instead of automatically succeeding to the chairmanship, he called for a special election to fill the vacancy and was himself elected by a vote of 22 to 4.

The difficulties encountered in accomplishing the Eighth Decennial Revision were very great, and a number of the most prominent officers and members of the committee died during the period in which the revision was being done. The work was handled so well, however, and the demonstration of his great executive and harmonizing abilities was so convincing, that when the Convention met in 1910 to select the committee for the Ninth Decennial Revision, he was the member receiving the largest number of votes cast for any individual as a member of that body and when the newly elected revision committee was organized for work he was immediately and unanimously chosen its chairman. Of the work on this later revision, issued a little more than a year ago, nothing need be said. It stands as a monument to his ability, the last and greatest work of his hand and brain.

In 1912 he presided over the Pharmaceutical Section of the

Eighth International Congress of Applied Chemistry at New York City.

The foregoing chronological survey of more than fifty years of Professor Joseph P. Remington's professional activities reveals a wealth of accomplishment that would suffice for a number of ordinary individuals. His was no ordinary nature, however. One of his secrets of success, which was really no secret at all, but an exhibition of that wonderful common sense which after all is so uncommon in application, was his system of combining work and play in such proportions as enabled him to do twice as much work as if he had devoted his entire time to work alone. His power of concentration, his passion for careful attention to details, his insistenc upon the same standards in those who worked for him, are all evidences of a master mind.

Early in his life, Professor Remington and his wife were both members of the Society of Friends, but about 1880 he joined the Episcopalian Church and was for many years intimately associated with Holy Trinity Church as a Sunday-School worker, a member of the Brotherhood of St. Andrew and as a vestryman.

His deep interest in church work was shown by the fact that he deeded the land and contributed generously to the finances of the Church of the Redeemer at Longport, which was under his immediate supervision while he lived and which was directed in his will to be turned over to the Diocese of New Jersey at his death.

His simplicity in his habits of life, his innate cleanness of thought and speech, his "camaraderie" and "gemüthlichkeit" were qualities that made him loved and respected. His loyalty to his alma mater and his constant thought and service in her interests can be attested by thousands of "his boys" as his students loved to hear him call them.

His deep abiding faith in the nobility and dignity of pharmacy as a profession was his strongest trait. No task was too difficult to perform, no expense was questioned when he saw a chance to be of service to a profession of which he was so proud. He probably has attended more meetings and taken an important part therein, than any other professional man of our time.

His diplomatic power and his harmonizing influence were wonderful. Time and time again has he stepped into the breach when discord seemed to reign supreme and by his compelling personal magnetism brought about a condition of harmony. He has been justly called a great stabilizer.

Equipped by nature with a winning personality, a gift of eloquence and of diction of unusually appealing quality, he has charmed thousands as a speaker upon various subjects, professional and otherwise. His gift of imparting knowledge and enthusiasm to others was marvelous. He has justly been called a teacher of teachers, for the land is filled with those who have sat at his feet and then have gone forth to carry the torch of knowledge to other generations.

His keenness and cleanness of wit, his qualities as an extemporaneous speaker have made him a toastmaster without a peer and he was much sought after upon occasions requiring such service. He was honest and conscientious to a degree that sometimes was inimical to his own interests. During his three decades of service in revision committee work he was ever careful to see that the U. S. Pharmacopœia was entirely finished and out of his hands before doing a particle of work on the revision of either the "Practice of Pharmacy" or the U. S. Dispensatory, lest it should be said that he took advantage of his advance knowledge to reap financial gain.

His family has lost a husband and a father, his college has lost a dean and a professor, his profession has lost its most shining light, and the world has lost a man—a man of whom it can be truly said that he conformed to Huxley's definition of one who had a liberal education, to wit:

"That man, I think, has had a liberal education who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth working order; ready like a steam engine to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of nature and of the laws of her operations; one who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of nature or art, to hate all vileness, and to respect others as himself."

Such a man was Joseph P. Remington. Generations of pharmacists shall not look upon his like again.

A LETTER TO THE EDITOR—RELATING TO PROF. JOSEPH P. REMINGTON.[1]

I have been informed that Professor Remington is very low, and that possibly we may never have the opportunity of another visit together. One may be excused, in a case like this, for addressing a mutual friend, even though the subject be painful to both, and thus I take the privilege of writing you, who, now residing in the city home of Professor Remington, as editor of the *Journal of the American Pharmaceutical Association,* will be in affiliating sympathy with persons like myself, afar off.

These many years ago Professor Remington and I met first in Indianapolis, Ind., at the meeting of the American Pharmaceutical Association, 1879. Professor Remington was then in the vigor of his early manhood. I studied him as a hero, because even at that date his magnificent services to pharmacy had led everyone to consider him as perhaps the most conspicuous incoming American engaged in pure pharmacy in all its outreaches. A professor in the Philadelphia College of Pharmacy; a successful conductor of a drug store in the city of Philadelphia; schooled as he had been with such men as Procter, Parrish and Maisch, with the practical experience that came from personal effort under that Nestor of American pharmacy, Dr. Edw. R. Squibb, in whose laboratory Professor Remington, close to Squibb, served an apprenticeship,—this, too. years after he began his apprenticeship opportunity with the established house of Charles Ellis Sons & Co., of Philadelphia. One can but comprehend that to the present writer the chance, to one whose opportunities had not been great, of meeting this celebrated pharmacist, was an epoch, an event.

May this writer not add that possibly but for Professor Remington he might not himself have been long in the service of pharmacy? Remington it was who championed his cause in a personal way at Indianapolis, even volunteering and reading the paper prepared by the writer for that occasion, "On the Conditions Necessary to Successfully Conduct Percolation."[2]

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[1] From the *Journal of the American Pharmaceutical Association,* January, 1918.

[2] See *Proceedings of the American Pharmaceutical Association,* 1879, p. 682.

Close together have we been since that date, each serving in the field of pharmaceutical opportunity, these fields often seemingly separated, and yet united as a whole. In my praise of Remington, I voice what seems sure to me to be the sentiment of thousands of pharmacists who, in separated sections of the country, have been in close touch with this leader of us all, Professor Joseph P. Remington, in Philadelphia.

My dear Mr. Eberle: May I not, in the frankest way possible, express to you these thoughts, and may I not accept that in expressing them, as a lingering member of the associates of Professor Remington who have passed away, as well as thousands of pharmacists in America who may not feel at liberty, as do I, to take that privilege, that I may add to the foregoing even yet a further word?

Among the past close friends of Professor Remington, none of whom are now with us, I recall Professor Saunders, of Canada, a bosom friend of Remington; they attended the National meetings and roomed together. Together they visited England, ovations marking their course in that country. So very close were they that the terms Joseph and William only were used in conversation. That very talented man, Professor John M. Maisch, a teacher-companion of Remington, attended always in Remington's company the meetings of the American Pharmaceutical Association; together they came, never a word of discord between them; companions were they, until came the announcement at our Chicago American Pharmaceutical Association meeting (1893) that Professor Maisch had passed away. Dr. Charles Rice, that remarkable man whose biography has never yet been written, and in my opinion never can be, was to Professor Remington, as to all others, an inspiration. Of Edw. Parrish, to whom Remington was an assistant, Professor Remington always thought and spoke with the utmost veneration, which was also true of Professor Wm. Procter, Jr. And be it said that the wealth of pharmaceutical opportunity that came to Professor Remington from these teachers and companions was distributed by him to the world-at-large. To thus name all the companions of the olden time, made by Professor Remington, would be to mention every teacher who had accomplished or contributed to the cause during the period of Remington's early activity.

But not alone with such as these did Prof. Remington fraternize. Not a student, within forty years, has been graduated from the

College of Pharmacy in Philadelphia, but feels that he is a close friend of sympathetic Professor Remington. It has been my privilege to meet many hundreds of these graduates of that long-established institution, and never, so far as I can recall, did a discussion connected with pharmacy occur but that the name of Professor Remington came in as that of one of whom the speaker knew personally. This, I will say, is literally true, because every member of the class of the Philadelphia College of Pharmacy for decades has been to Professor Remington a personal charge, and Remington being in the department of pharmacy is naturally very close to any student whose life work is to be pharmacy.

But what of other companions? To my mind's eye they arise, everywhere.

Wherever there was to be an event in pharmacy that would bring together men imbued with the cause of pharmacy, Remington was sure to be present, and not alone was he present, but actively so. A leader among them all was he. If an address was to be made, Remington was the one selected for the purpose, in whatever direction it may have been necessary. And, Remington never failed. At alumni meetings and college reunions held by pharmaceutical organizations Remington was considered one of the members, as much so as though his college course had been in their college. Be it known, to Professor Remington the cause of pharmacy was cosmopolitan, and he considered himself to be concerned in every phase of pharmaceutical effort. Whoever was teaching, whoever was studying, whoever was contributing in any direction, and from any direction, was in his circle.

Perhaps the most enjoyable of all occasions at the various meetings of pharmaceutical associations that it came my privilege to attend were those of the alumni of the Philadelphia College of Pharmacy, and in these always Professor Remington was not only an integral part, but a cherished guest; a representative of the world-at-large, as well as of the college to which he devoted his special time.

And not alone with those concerned in manipulative pharmacy such as becomes the charge of the apothecary, but of men engaged in pharmaceutical activities on a very large scale, such as came into the field with the entrance of the factory manufacturer, "the manufacturing pharmacist," did Professor Remington affiliate, by right of education. His personal experience with Dr. Squibb, the connection his preceptors, Procter and Parrish, held with such as Tilden and Company, Charles Ellis Sons and Company, Wm. R. Warner and Company, Hance Brothers and White, Charles Bullock, Sharpe and Dohme, Frederick Stearns, of Detroit, and others of the struggling pioneers of those days, led Professor Remington to a kindly affiliation with those establishing and conducting such industries as these. He appreciated that they had become a part in American pharmaceutical evolution, and that in their activities the factor of pharmaceutical education of the individual should dominate. And hence we note his kindly affiliation and helpful services to those who came in later, principal among whom may be mentioned Parke, Davis & Co., of Detroit, and Eli Lilly & Co., of Indianapolis. Well do I remember how, when Mr. Eli Lilly, founder of the house, gave a home banquet on a special occasion two decades or more ago, Professor Remington made the journey from Philadelphia to Indianapolis. And surely Remington would have made that journey if for no other reason than to please his pupil, J. K. Lilly, whose pharmacy instruction was taken under Professor Remington in the Philadelphia College of Pharmacy. Well do I remember that happy occasion, which it was also my privilege to enjoy.

As would be supposed from the congenial nature of Professor Remington, which so impressed everyone he met, his family relationship is most delightful. To touch this phase of his life is a very delicate subject, even in a letter to a mutual friend, but yet I cannot refrain from expressing to you the pleasures that have come to me in the visits to and from Professor Remington's family, and members thereof. To enter that home is like entering one's own, because of the whole-souled hospitality of each and every member. To this it may be added that Professor Remington's love and affection for his wife and children, as shown to his personal friends, is only paralleled by a reciprocity from themselves. Taken all in all, a very happy and a very charming family is the Remington family I have in mind.

My dear Mr. Eberle: I feel that this letter is much too long, and yet its space would be much too short were one to attempt to present even the high lights of a biography of Professor Joseph P. Remington. I have recorded but a touch of what came to me in the passing along of a discursive letter, as thought crushed upon thought, event upon event, opportunity close following opportunity in the direction of what I felt needs be said, and yet for lack of space, could not be said. Painful though it is to think that I am writing this letter during what may possibly be the closing period of the life of this companion and friend, it is yet a melancholy pleasure to feel that I am not passing the bounds of prudence. All I have said and more will be felt by others who were more fortunate, others who were in daily touch with Professor Remington, as it was not my privilege to be, and who may not, as do I, assume the responsibility of intruding a personal letter.

Strange how insidiously Time moves us in and out. Of those close in the companionship of Professor Remington and myself in days long gone by, very, very few are living.

May I not close this letter with a sentence from "The Code of Manu"—

"As drifting logs of wood may haply meet
On ocean's waters surging to and fro,
And having met, drift once again apart,
So, fleeting, is the intercourse of men.

"E'en as a traveller meeting with the shade
Of some o'erhung tree, awhile reposes,
Then leaves its shelter to pursue his way,
So men meet friends, then part with them forever."

Sincerely yours,
JOHN URI LLOYD.

CINCINNATI, O., December 29, 1917.

THE FUNERAL OF PROFESSOR JOSEPH PRICE REMINGTON.

Professor Joseph P. Remington's body was laid in its last resting place on Friday, January 4, 1918. There was a private service conducted at his late residence, 1832 Pine Street, by his youngest son, Rev. Wm. P. Remington, who officiated in the uniform of an army chaplain.

The public services were held in Holy Trinity Episcopal Church at 19th and Walnut Streets, and the services here were conducted by the Rector, Rev. Floyd W. Tomkins.

The honorary pall-bearers were Dr. Harvey W. Wiley and Samuel L. Hilton, of Washington, D. C.; Dr. William Jay Schieffelin, of New York; Samuel C. Henry, of Chicago; Joseph L. Lemberger, of Lebanon; and the following Philadelphians: Prof. Charles H. LaWall, Prof. Frank X. Moerk, Prof. E. Fullerton Cook, Howard B. French, Dr. Richard V. Mattison, Dr. Adolph W. Miller, Dr. Charles A. Weidemann, Warren H. Poley, C. Stanley French, George B. Evans, George M. Beringer, Joseph W. England, Walter A. Rumsey, Richard M. Shoemaker, Jacob M. Baer, Aubrey H. Weightman, Otto W. Osterlund, Prof. Samuel P. Sadtler, William L. Cliffe, Henry K. Mulford, Edwin M. Boring, Theodore Campbell, Charles Leedom, Jacob S. Beetem, of the College; Morris Earle, J. W. Townsend, Samuel Hinds Thomas, William West Frazier, Henry H. Collins, George R. Yarrow, Carroll S. Tyson, Charles F. Gummey, Dr. John B. Roberts, Carl N. Martin and C. C. Morris, of Holy Trinity Church.

The coffin was carried down the center aisle of the church upon the shoulders of four young men and deposited in front of the chancel, the railing of which was banked with many handsome floral tributes from friends and organizations all over the United States.

The vested choir sang some of Professor Remington's favorite hymns during the service, which was the brief, beautiful and impressive one of the Episcopal Church. That part of the service usually conducted at the grave was completed in the church. The interment was private and was attended by only the members of the family and four of the closest friends from among the honorary pall-bearers. The burial took place in the Friends' Burying Ground just across Cobb's Creek, a short distance south of Market Street. No services were held at the grave but just as the body was being lowered into its last resting place, his son, Rev. Wm. P. Remington, stepped to the head of the grave and offered a beautiful prayer.

The only flowers accompanying the body to the grave were those presented by the Faculty of the College. All of the others were sent to various hospitals in the city, to bring joy to the sick and suffering. This was in recognition of a practice which he was known to favor.

THE MEMORIAL MEETING TO PROFESSOR REMINGTON.[1]

A very impressive memorial meeting to Professor Joseph Price Remington, dean of the Philadelphia College of Pharmacy, who died January 1, 1918, was held January 4, immediately after the funeral services, in the library of the college he loved so well and in whose service he spent so many years of his life. The room was filled with the Philadelphia friends, associates and former students of the dean, and a surprisingly large number of men from other cities, considering the weather and the condition of the train service. Men prominent in all pharmaceutical activities paid tribute to the memory of this international figure in pharmacy, either personally or by telegram and letter. These tributes were sincere and came from the heart, as the emotion of the speakers testified.

The meeting was called to order promptly at 3 o'clock by President Howard B. French, who said:

This meeting has been called as a memorial meeting to the late Professor Joseph Price Remington. The college held a special meeting on Tuesday, January 2, and adjourned until to-day, so that due and proper honor could be paid to the memory of one of the greatest pharmacists that ever lived." He then asked the secretary of the college, Dr. C. A. Weidemann, to read a letter received from Mr. George M. Beringer, chairman of the board of trustees, who was prevented from being present by a broken ankle, the result of an accident. Mr. Beringer's letter was as follows:

In the midst of the overshadowing sorrow at the passing away of this illustrious friend and foremost American pharmacist, my thoughts revert to that time, nearly forty years ago, when I entered the Philadelphia College of Pharmacy as a student and came under the tuition of that trio of master teachers, Professors Maisch, Remington and Sadtler. Each of these, by a personality as noteworthy as their ability, won the esteem and affection of their students.

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[1] Prepared by Mrs. Charles H. LaWall.

The moral influence that Professor Remington during the last fifty years has exercised in molding the characters and lives of his numerous students, while imparting to them technical and professional instruction, has been no small part of his life's work. The value of this preceptorship can be attested by many pharmacists and by their example this influence will continue to extend to the oncoming generations of pharmacists.

In later years as a member of the college and as a trustee thereof and especially as the chairman of the committee on instruction, it was my privilege to become more closely allied with him and better acquainted with his work as a teacher and his services as the dean. Likewise, in the American Pharmaceutical Association and as a member of the Committee of Revision of the Pharmacopœia of the United States, our interviews were frequent and our correspondence voluminous. In these I often obtained a closer view of the character and determination of Professor Remington and learned of his remarkable knowledge of men and their mental peculiarities. Above all, I learned of his ability as a leader, which enabled him to enthuse others and obtain their best efforts.

It was this latter qualification that made him so successful as chairman of the committee of revision of the Pharmacopœia. In the Eighth and Ninth Decennial Revisions of the U. S. P., we have an established record of his efficiency as chairman, and the progress made and the advanced scientific standing of these revisions can be very largely attributed to the ability and indefatigable efforts of the chairman.

Following the illustrious examples of Procter and Parrish, Professor Remington nobly carried on the work that they had commenced and has established the teaching of pharmacy on a solid foundation. His monumental literary works, " The Practice of Pharmacy " and the pharmacy of the United States Dispensatory, mark his preëminent position as an author in this, his chosen field. Professor Remington has left a record replete with accomplishments for pharmacy.

To know him was but to admire; to work with him was an inspiration, and to carry on his plans for the advancement of pharmacy becomes now a sacred duty. George M. Beringer.

Camden, N. J., January 4, 1918.

Resolutions from the Pennsylvania Pharmaceutical Association were read as follows:

The Pennsylvania Pharmaceutical Association, through the undersigned committee, begs leave to present the following resolutions to the Memorial Meeting in honor of

Professor Joseph Price Remington

at the Philadelphia College of Pharmacy, January 4, 1918.

Whereas our Heavenly Father has called from our midst Joseph Price Remington, one of the founders and a former President of the Pennsylvania Pharmaceutical Association, and

Whereas, Professor Remington, through his loyalty and devotion to the interests of pharmacy generally and the Pennsylvania Pharmaceutical Association in particular, endeared himself to all of our members, and

Whereas it is felt that pharmacy, through his passing away, has lost one of its greatest men who, as a teacher, author, association worker and adviser, left the impress of his character with thousands of students, pharmacists, chemists, physicians and other men of affairs; therefore, be it

Resolved that the Pennsylvania Pharmaceutical Association expresses its keenest regret and sorrow at his passing and extends the sincerest sympathy to the members of his family in their hour of sorrow; and be it further

Resolved, that a copy of these resolutions be spread upon the minutes of the Association, and a copy be sent to the members of his family.

W. H. Knoepfel, Scranton, President,
J. A. Koch, Pittsburgh,
W. L. Cliffe, Philadelphia,
J. L. Lemberger, Lebanon,
C. C. Campbell, Pittsburgh,
Respectfully submitted,
(Signed) Robert P. Fischelis,
Secretary.

Then followed the reading of the resolutions prepared by a committee appointed by the Philadelphia College of Pharmacy, presented by Joseph W. England, chairman of the committee.

In Memoriam Joseph Price Remington, 1847–1918.

Whereas, In the demise of Joseph Price Remington, American pharmacy has lost its foremost figure and the Philadelphia College of Pharmacy its most distinguished son, therefore be it

Resolved, that we, the members of the Philadelphia College of Pharmacy, in special meeting assembled, express our deep sorrow at his passing and pay tribute to his work and worth.

As a pharmacist, he labored in all the branches of pharmaceutical practice, retail, wholesale and manufacturing, acquiring an unusually wide experience. He was graduated from the Philadelphia College of Pharmacy in 1866, the subject of his thesis being "Our Alma Mater, Its Rise and Progress," little dreaming, perhaps, that he was destined to become a most important factor in its development during the next fifty years.

As an educator, he was trained by Edward Parrish and William Procter, Jr., two of the greatest pharmacists that American pharmacy produced in the last century. In 1874 he was elected to the chair of theory and practice of pharmacy of his alma mater, later becoming also professor of operative pharmacy and director of the pharmaceutical laboratory (1877) and then dean of the college (1893). He has taught thousands of students. He was an impressive teacher, presenting his subjects in a logical and practical manner; his language was clear and forcible and his voice distinct and penetrating. He had a magnetic personality and his lectures made a deep and lasting impression. He was the students' friend, beloved by all. He may have been said to have been a teacher of teachers, for most of the successful teachers of pharmacy in America to-day have been pupils of his at some time in their careers.

Not only this, but he exercised a potential influence upon pharmaceutical education, generally, being most active in developing many improvements and important changes in methods of teaching. His method of instruction in operative pharmacy led to the creation of a pharmaceutical laboratory in the Philadelphia College of Pharmacy, the first of its kind in this country, the essential features of which have been adopted by nearly all of the colleges of pharmacy in the United States, and he was the first to visualize the importance and necessity of teaching commercial pharmacy in schools of pharmacy and to establish such a course.

As an author of pharmaceutical textbooks, he had a national and international reputation. He was the author of the 'Practice of Pharmacy,' first issued in 1885, used in every college of pharmacy in this country, and widely known abroad, the associate editor of the United States Dispensatory since 1879, the fifteenth edition of which was published in 1883. This edition and the later ones have proved to be the most successful ever issued. Prior to 1883, the work was edited entirely by physicians; since then American pharmacy has been honored by having placed upon the title page of this book the name of a pharmacist as one of its editors and has been properly recognized in its relation to medicine.

As a member of the American Pharmaceutical Association he was most active. Joining in 1867, he served the Association in many capacities, being a regular attendant at the annual meetings, taking a leading part in the discussions and presenting papers on many important subjects, as the volumes of the *Proceedings* and *Journal* since 1868 bear ample testimony. His good judgment and safe advice were constantly in demand. He was chairman of many important committees. He proposed the plan which was adopted for the establishment of the council in 1880 and was its chairman for seven years. In 1887, he elaborated a plan for the reorganization of the Association, dividing the scientific work into sections, and secured its adoption. He was president in 1892–93 and permanent secretary in 1893-94.

In 1887, the American Pharmaceutical Association appointed him as a delegate to visit the American Medical Association, and he induced that Association to establish a section of materia medica and pharmacy, which has since become the Section of Pharmacology and Therapeutics. He was chairman of delegations subsequently sent to this Association, and on such occasions rendered valuable service in bringing the professions of medicine and pharmacy into closer relationship.

Not only in national pharmaceutical affairs was he active, but he took a deep interest in the growth and development of state associations, frequently attending their annual meetings, making addresses and presenting papers. He was one of the charter members of the Pennsylvania Pharmaceutical Association in 1878 and its president in 1890.

As an executive and leader of men he had international fame. He was president of the Seventh International Pharmaceutical Congress (1893), a delegate to the Pan-American Medical Congress (1893) and to the Second Congress in Mexico (1896); represented the United States in the Eighth International Pharmaceutical Congress at Brussels (1896) and was president of the Pharmaceutical Section of the Eighth International Congress of Applied Chemistry (1912). He received the honorary degree of Master in Pharmacy from the Philadelphia College of Pharmacy and from the Northwestern University of Illinois the honorary degree of Doctor of Pharmacy, Phar.D. He was a Fellow of the Chemical, the Linnæan and the Royal Microscopical Societies of Great Britain; honorary member of the Pharmaceutical Gesellschaft zu St. Petersburg, Institute Medica Nacional of Mexico, Societé Royal de Pharmacie de Bruxelles, Societé de Pharmacie d'Anvers; an active member of the Philosophical Society, American Chemical Society, American Geographical Society, Academy of Natural Sciences of Philadelphia, Historical Society of Pennsylvania; honorary member of the Pharmaceutical Society of Great Britain, British Pharmaceutical Conference; member of the Federatione Internationale Pharmaceutique of The Hague, Franklin Inn Club of Philadelphia, Chemists' Club of New York and Authors' Club of London.

But his greatest work probably was as chairman of the committee of revision of the Pharmacopœia of the United States of America, a work which has become of vast importance by reason of its legal standing under the Federal and State Food and Drug Acts. His connection with the U. S. Pharmacopœia began in 1877, when he served on an auxiliary committee of revision. In 1880, 1890, and 1900 he was sent as a delegate of the Philadelphia College of Pharmacy to the national conventions and in these served as first vice-chairman of the final committee of revision. Upon the death of the chairman of the committee in 1901, Professor Remington was made chairman, and was again elected in 1910, holding the position until his death. The Ninth Revision, issued in 1916, may be truly called his monument, since the whole work is stamped with his personality.

As a man, 'we ne'er shall look upon his like again.' 'Genial, eloquent, clean-hearted and clear-minded,' possessed of unusual natural ability coupled with rare executive capacity, he served his day and generation, loyally and enthusiastically, and left a record of achievement that may well serve as an example to future generations.

Just a personal note: Professor Remington was gifted with a charming personality. His courtesy, his tact, his ability to adapt himself to all types of people, made friends of all those he met, while his strong, clean intellect served to inspire them. The meaning of his departure from life may be expressed in the following lines from S. Weir Mitchell's beautiful poem, 'Evening':

> "I know the night is now at hand,
> The mists lie low on hill and bay,
> The autumn sheaves are dewless, dry,
> But I have had the day.
> Yes, I have had, dear Lord, the day:
> When at Thy call I have the night,
> Brief be the twilight as I pass
> From light to dark, from dark to light."

Resolved, that this appreciation be entered upon the minutes of the Philadelphia College of Pharmacy, and a copy sent to the family of the deceased.

J. W. England, *Chairman,*
Samuel P. Sadtler,
Charles H. LaWall,
Julius Sturmer,
Harry K. Mulford,
Committee.

Philadelphia, January 4, 1918.

After the reading of the above resolutions of the College, the president announced that a motion to adopt was in order. Professor Eberle moved an amendment, as follows:

I would like to move a recognition of the appropriate words in which these resolutions have been presented and that we acknowledge the sentiments as our own views by a rising vote.

The motion was unanimously carried by a rising vote.

The following are the resolutions adopted and presented by the Faculty of the College:

PHILADELPHIA, January 4, 1918.

At a meeting of the faculty of the Philadelphia College of Pharmacy held this day, the following resolutions were unanimously adopted:

WHEREAS, Providence has seen fit to end the earthly career of one of our number and has taken from our midst our beloved associate, Professor Joseph P. Remington, our senior member, and one endeared to us all by years of association, we would

Resolve that we hereby express our sense of the loss which is brought home to us personally as his associates, assistants, and colleagues of many years, during which his friendship, counsel and kindly help were constantly at our command.

We would also express our sense of the great loss which the College has suffered in the death of one who was not only its most distinguished alumnus, but who stood for years as a tower of strength, as its most eminent representative among the educational forces of the pharmaceutical profession.

Not only did he, as a pharmaceutical author and writer, do credit to our institution throughout the world by the international reputation he developed, but he worked incessantly as official and unofficial delegate and visitor to further the interests of pharmaceutical education and advancement, as illustrated in the work of our College.

We would also call to mind the sense of loss which will be felt by hundreds of his former students to whom he was not merely a memory but had continued a personal friend and frequent helper and advisor.

Resolved that we tender to his family our deep sympathy in their hour of bereavement and express the hope that they be comforted by the belief that he has gone to his eternal reward.

(Signed) SAMUEL P. SADTLER,
CLEMENT B. LOWE,
FRANK X. MOERK,
Committee.

President French then called on various friends and associates to give expression to their appreciation of and esteem for Professor Remington, the first being Professor Emeritus Samuel P. Sadtler, who has been connected with the college for many years and associated with Professor Remington in many activities. He spoke as follows:

Mr. Chairman and Gentlemen, Friends of the College, Friends of the late Professor Remington: It is, of course, a very personal and therefore a very hard matter for me to talk this afternoon. I became acquainted with Joseph Price Remington first in 1878, when I was called here to assist the late Dr. Bridges in the lectures on chemistry. We became very intimately acquainted, shortly thereafter, as we both worked from 1880 on at the U. S. Dispensatory, and from that time our association was very close and we came to know each other very well. Independently of that work, our constant association in the teaching work of the College and later on the U. S. P. Revision Committee brought us into closer contact. All this threw me constantly into association with him. Therefore I feel a great personal loss. The feeling of that loss will be a recurrent one, not to-day alone, but repeatedly.

I want to speak more particularly of the loss which this college and pharmacy generally will sustain in the death of Professor Remington. He was not only the most widely known and honored professor of this college and the dean of the college, but we may properly say that he took the whole burden of looking after the name and interests of the college throughout the world. Wherever pharmacists were gathered he was looked upon as the typical representative of the Philadelphia College of Pharmacy. His loss will be felt, not only to-day, but through succeeding years. American pharmacy has suffered a great loss. Many of the gentlemen here will testify, from personal knowledge, that he was in touch with every phase of these varied activities probably more than any other man in the United States, not only in the teaching of pharmacy but in presenting pharmacy and its achievements to the public, and later in making up that great summary of pharmaceutical teaching for the medical and pharmaceutical professions, the United States Pharmacopœia, which has moreover, since the passage of the Food and Drug Act, become the legal standard for the purity of drugs and medicinal preparations. The work that he did on the U. S. Dispensatory and his own 'Practice of Pharmacy,' beginning in 1883, must also be remembered.

In all of these lines he was active and foremost, taking the work of several men on his own shoulders. He had reached the age of three score and ten and any years that remained after that must be considered as a gift of Providence. While he could not have continued to work with the same energy it would have been well if he could have been spared as a counsellor. Of course, when people reach that age we do not expect much more of activity, but the man who retains his faculties can be a valuable aid and adviser to younger men.

I have said that I have a sense of personal loss and I have tried to point out the loss which the profession of pharmacy and the teaching of pharmacy will experience in his death. We shall only begin to realize this as succeeding years roll by.

President French then said: You will pardon the chair for giving a personal experience. My first acquaintance with Professor Remington started in 1855 or 56. Possibly I have known him longer than anyone in this room, as we started our friendship playing together as boys.

His loyalty to the college has always been an inspiration to me and for many years we have worked together for the benefit of this old institution. He and I looked forward with great interest to the centenary of the Philadelphia College of Pharmacy, which will take place in March, 1921.

I presume that I have been connected with this institution possibly as long, or perhaps longer than any man living to-day—50 years last October; and during this association and connection I came into close contact with Professor Remington, and I have learned to respect and honor him. He was a strong character, firmly believing that he was doing the best, by his devotion to the college, for pharmaceutical learning throughout the world. His loss to us is a serious one and I realize what a burden has fallen upon the shoulders of those who are left. We shall have to do our best to follow his example and emulate the loyalty he so frequently expressed for the institution.

He then called upon the following to pay tribute to Professor Remington in the order given:

Professor J. W. Sturmer, Associate Dean of the College:

PROFESSOR REMINGTON, THE TEACHER.

Man is a bundle of many attributes—some of them reciprocally synergistic, some of them seemingly incompatible; and while it may be difficult to sum up a great man's work in a few brief words, it is more difficult still to explain how he achieved his results and to name those personal characteristics of his which made them possible. But it is not my purpose to marshal in review the many achievements of Professor Remington and to disclose the secret of his success. I desire merely—with a sad heart—to lay my humble twig of laurel upon his grave.

And I will speak, Mr. Chairman, of Professor Remington, the teacher, for whatever else he was and whatever else he accomplished, he was primarily and fundamentally a teacher, a teacher of the first rank. What qualifications are necessary to a great teacher? We are informed that a teacher of pharmacy should have acquired a certain sum of knowledge, should have attained to certain scholastic degrees. But a pool of water, even though it be a large one, does not necessarily constitute water power; and a man who is a great reservoir of knowledge is not necessarily a great teacher. Professor Remington was a great teacher because he possessed, in addition to the requisite learning, that fine altruistic spirit which made him desirous to help others, to give, to give to his students of his knowledge, of his time, of his energy. of his wisdom. Further, he had a keen insight into human nature. He understood men, knew the youthful mind, could sense the attitude of his classes. He appreciated that students are not uniform units which could be dealt with *en masse,* but that each represented a distinct individual, a distinct personality. Hence his great success in establishing those cordial relations, indeed personal friendships, which did not cease with the students' college days. When I—a youth of twenty-one—had been appointed an assistant in a distant university, my preceptor, a graduate of this college, told me about a visit he had just paid to his former teacher, Professor Remington, who received him with a warmth of welcome which came from the heart and which made of this visit an instance to be treasured in the memory. 'Young man' said my preceptor, 'make your students like you, as Professor Remington makes his students like him, and you will succeed as a teacher.' A strange coincidence, that fortune associated me on the same faculty, during the past few years of his life, with the great teacher who had been pointed out as an exemplar.

Nature had endowed Professor Remington splendidly. He had a commanding presence, a clear, pleasing voice, and a smile which was infectious. In his discourses, he ran the gamut of didactic exposition, humorous anecdotes, and thrilling bursts of impassioned oratory.

Is it any wonder that he was a great energizing force, a catalytic agent, who stimulated his students to study and to work, not only during their college days, but for life? And to-day, thousands of his graduates throughout this broad land are performing worth while work in this work-a-day world, dispensing, compounding, manufacturing, inventing, writing, teaching.

What Huxley did for biology and Tyndal for physical science, Professor Remington did for pharmaceutical science; he popularized it, gave it a human interest, gave it life.

His activities have now ceased; he has laid away the crayon and the pointer of the class room and folded his hands for the long, mysterious rest. But the fruits of his labors will grow through the years. As long as illness and pain are the common portion of the sons of men, there will be need for the makers of medicine. Pharmacy therefore, will endure, and so will also the fame of its great teacher—Professor Joseph Price Remington.

Dr. Harvey W. Wiley, President of the U. S. Pharmacopœial Convention spoke as follows:

Mr. President, Ladies and Gentlemen: I am here in two capacities to-day. I am here to represent, first of all, the Pharmacopœial Convention and the board of trustees thereof, and secondly, in my private capacity. I want to speak first of Professor Remington's work in a professional way. I think very few of you realize, except those who have worked with him, the magnitude of the work which he undertook. Fortunately, he came to the Ninth Revision with a very valuable experience which he gained in the Eighth Revision, so that he was the ideal person to head the great revision committee, both in professional ability and experience. I learned a great deal of the magnitude of the work during the past eight years, and I have often wondered how he could physically and mentally endure the great strain that was placed upon him. He did not. I doubt not at all that his death was very much hastened by his labor on the Ninth Decennial Revision. But he would not withhold his hand in fear of death, although I have asked him to do so, because, in my opinion, he considered the one place to die, of all others, is in harness, and if Professor Remington had known that he could have prolonged his life by declining the burden. I am sure he would not have done so. As I look back upon the last eight years, I have more and more come to realize that Professor Remington was the great stabilizer. You know they are using the gyroscope now to stabilize ships upon the sea. The tendency of the gyroscope is to remain, by reason of inertia, in *statu quo,* and when it revolves it remains in that position and it takes great force to push it aside, one way or the other; so if you have a gyroscope in full action it will hold the ship in position.

The effect that Dr. Remington had upon the great work of revision was that of the gyroscope. He held it true to its course, and no one knows more than I the forbearance he had to exercise to hold it so. There were very many intricate questions to decide, and if there had been a man of less ability than Professor Remington at the helm, he could not have steered the ship clear of all dangers and brought the revision committee through. That alone stamped him as a man of great character and force. No one who took any part in these deliberations would fail to recognize his strong guiding power and resistance to pressure.

One of our great authors, Emerson, I think it was, has described character as the grass, which is flexible and not firm; every wind moves it. As it grows up it will not yield as it did before. So with human character. It is not so much education and heredity, but the result of experience, and when guided by a heart which is always true and a brain which is always clear, every experience of life builds character. No wonder that Professor Remington approached the end of his life with such a character; his great care was always to avoid the wrong and uphold the right. This is the view I have gained of him during the years of association with him.

One of his great monuments is the Ninth Revision of the U. S. Pharmacopœia. It is his book. Louis XIV spoke of the state and said 'C'est moi'—'It is I.' So, in speaking of the U. S. Pharmacopœia, we can say 'C'est lui'—'It is he.' And so, as the official head of the organization which produced this book, I have come to pay tribute to his memory.

"That I can do rather easily, but when I come to the second part of my theme I feel it almost impossible to say what I should like to say, and that is about Professor Remington as a friend. I have known him considerably over a third of a century. His was a friendship which grew upon one, as one knew more and more his worth and loyalty, and I could have shown no better illustration of my friendship than in the christening of my first boy. My wife kindly permitted me to choose the godfathers and I chose Joseph P. Remington and John Uri Lloyd, and I am glad to know that my boy, now approaching his sixth year, will realize (he does realize now) his loss at the death of his godfather and realize it more and more as he grows older. What a blessing he had in two such godfathers! There is nothing in my personal history that I prize more than that event. And so I have learned to prize Remington more and more as the years go by.

I do not quite agree with Professor Sadtler in saying that when a man is seventy, he perhaps is not of much more use in life. If I had quit at seventy I would not be here to-day; I am seventy-four. I feel that it is hardly a compensation for our loss to think of Professor Remington as having lived his whole life. No good man ever lives his whole life. The old adage says that the good die young. I have seen a clever addition to that saying—'The good die young, no matter how long they live,' and Remington would have died young had he lived to a century, because he had in him the spring of eternal youth. No man grows old whose heart is young. The beautiful words of one of your local poets, Dr. S. Weir Mitchell, have already been quoted here, and may I return to one of my friends of 2000 years ago in endeavoring to express to you the feeling I have to-day? The old Latin poet said 'Nil ego contulerim jucundo sanus amico'—'As long as I am in my right mind I shall never prefer anything to a delightful friend'; and so I say that as long as I am in my right mind I shall never prefer anything to the delight I have had in the association with this friend.

Prof. J. A. Koch, dean of the Pittsburgh College of Pharmacy said:

I have come to pay tribute to the memory of my friend, Professor Remington. I do not know when I first met him, but I do remember when I first learned to know him. It was here in this building, twenty years ago, just after I first took up my duties at the Pittsburgh College of Pharmacy. I came to see Professor Remington and the advice he gave me and the goodness of heart with which he took up my case were overwhelming. I have, from that time on, felt that I had in him a friend. It has been my good fortune to meet him very frequently and I was especially fortunate in being able, in 1913, to spend seven weeks with him when we were together as delegates to the International Pharmaceutical Congress from the American Pharmaceutical Association, and I then learned to know him as I never would have learned to know him in any other way. I felt very much pleased to think that he liked me and liked to have me with him; that was what he told me. I feel very proud of that. I have simply come to pay tribute to his memory and to mourn with you your loss.

Mr. J. L. Lemberger, Lebanon, vice-president of the Philadelphia College of Pharmacy:

I have had in my heart the last few days a feeling of the greatest sadness of my life, the parting with my dear friend, Professor Remington. We had known each other intimately for perhaps thirty years or more. We were as intimate as two brothers almost. I had his confidence in many things; he had my confidence in many things. There was but one side to Professor Remington—he was all around right. He was moved to do right by a conscientious desire to do so. Can I say anything better of our departed friend? I knew him well enough to know that it was a principle of his life.

In the many things we had in common, American Pharmaceutical Association, Pennsylvania Pharmaceutical Association, this dear old college, our alma mater, when we came to sift down to what we would call the bottom facts of the thing (his name is Joseph and my name is Joseph; we knew each other as 'Joe'), our conclusion always was, 'Joe, we must do right in this matter.' Can we have a pleasanter memory of a good man than to think of him as having been conscientious in all matters of life, moved by a desire to do right?

"I went out to the cemetery and looked into the open grave and said 'Farewell'; not good-bye forever, but 'Farewell.' The memory of his life will come to me every time I enter this college and every time I go to an association meeting, and we shall think of Remington; what a great delight it will be to have such a memory of a friend. He lived a good life, a useful life, and he had a joyous disposition, a magnetic disposition. He filled the room with his presence, whether in the college or in the circle of that dear home of his. His end came peacefully indeed, very peacefully. His end was such as we might desire to be ours, when the time comes, and a hallowed thought is 'May our lives be as fruitful as his was; when we come to the end may our end be as was his.' We think of him now, not as a loss to us, but as living on, on, on, in that world, where 'Eye hath not seen nor ear heard, neither has it entered into the heart of man to conceive,' the joy that our dear Brother Remington is now enjoying.

Prof. H. V. Arny, professor of organic chemistry in the New York College of Pharmacy:

Mr. Chairman: I am here in more than one capacity, not merely in the rôle of a student mourning the loss of his great teacher, but also as the official representative of the New York College of Pharmacy. Dean Rusby asked me to express particularly to the sister institution the profound feeling of sympathy in the loss of your dean and the great regret that his college duties prevented him from coming himself. I wish, however, to particularly emphasize the feeling of personal loss. In Mr. Beringer's letter, mention was made of the great triumvirate of teachers; I will add a fourth to the list—Maisch, Sadtler, Remington and Trimble. These four men, I think, exercised a greater influence upon pharmacy than any other four men ever did, standing as disciples not only of true pharmacy, but also of sceince, and of these four there was none that we recognize as greater than our departed friend. I will even go so far as to say that all the success I have had in teaching I attribute very largely to Professor Remington. I owe him a debt of eternal gratitude. He had a way of taking a dry fact and of connecting it with an anecdote that impressed it on the mind, as no other teacher I know of could do. It has been my privilege to hear many great teachers, but in my opinion, there was none superior to Professor Remington as far as beauty of diction or interest is concerned.

My heart is too heavy to say more, except that it is not merely as a teacher, but as a personal friend of Professor Remington that I wish to say a word. He was always courteous, even when he differed from a man; he was always the same sweet, gentle, kindly man. I am here chiefly as a mourner; I have lost one of the dearest and best of friends.

Mr. Samuel L. Hilton of Washington, D. C., treasurer of the board of trustees of the U. S. Pharmacopœial Convention:

Mr. President, Ladies and Gentlemen: It was my privilege some thirty years ago to become acquainted with Professor Remington. I now consider it a privilege to have the opportunity to pay tribute to his memory. The acquaintance of such a man was an inspiration to me. It led me to follow his advice, his counsel, and to look upon many subjects from the point of view of what is right and what is wrong, so that I feel I made few mistakes in considering questions pertaining to pharmaceutical subjects when I looked upon them from the viewpoint of Remington.

I have been associated with him in various kinds of work for years. We frequently called on each other and I have learned to love him. In the loss of Professor Remington, American pharmacy has lost its brightest light. It has lost a man who has done more for the advancement of pharmacy than any other man for the past twenty-five years. My heart is full; I do not possess the words that are necessary. There is no one in American pharmacy for whom I had greater respect.

On many occasions I have called at this institution to seek his advice and I have always found him correct and wise in his judgment. I have differed with him and he has always taken it in the proper spirit. This is an occasion when every one connected with pharmacy feels his loss. In U. S. P. work during the last two decades, Professor Remington has been the man upon whom everyone in connection with that work has depended. Dr. Wiley has said that he had the faculty of bringing divergent views together in a way that was best for medicine and pharmacy. Is there any higher tribute that can be paid to the memory of Professor Remington? His name will go down in history with that of Procter and Maisch.

Mr. Caswell A. Mayo, editor of the *American Druggist,* New York:

For many years it has been my great privilege to have known Professor Remington. I knew him first as a teacher. I came here, a callow youth, from the state of Mississippi, with a little knowledge of pharmacy and science, called here by the great reputation my alma mater enjoyed as a teacher of men. I think that Professor Remington had, to an extent which I have never seen equaled, the peculiar capacity which is required of a successful teacher.

Many teachers are wise, many have many attainments, but no ability to inspire in their students that zeal for study, that desire to avail themselves of all the opportunities which the institution offers, which he possessed in so eminent a degree. I think one of the best monuments of his life is in the teachers he taught. Others have spoken of him as being preëminently a teacher of teachers. I think there is hardly an institution of pharmacy in the United States where you will not find teachers made by him.

After I had progressed somewhat in my pharmaceutical career, I became an observer of men, and next a critic and writer. In the latter capacity I had an opportunity to study Professor Remington's work in every phase. As an editor he was remarkably successful. One of his peculiar characteristics was brought out in a conversation which I had with him about his new 'Practice of Pharmacy.' He had been very kind to me and knowing that I was going into journalism, was discussing the various phases of it, and said, 'Now, Mayo, I have been criticized and people said that I did not write the "Practice of Pharmacy," but that A. B. Taylor wrote it. A man's personal capacity is limited; he must enlist the intelligent coöperation of other men if he wants to make a success. The Philadelphia idea (this was thirty years ago) has been that a man does not do a thing if he does not actually do it with his own hands. It is a mistake, he must do it with his brains. My book is a success inasmuch as I have directed the making of it.'

He has had throughout his life the faculty of directing and showed it in a remarkable degree in the U. S. Pharmacopœia. As an association worker I became associated with him, and I have always been impressed by his quality of being a stabilizer, as Dr. Wiley says. I have heard, at meetings, the most bitter vituperation and people have come to the pass when they called each other names. Professor Remington would step in and stabilize the discussion and point out the moderate ground where all could meet, in a way that would lead the entire discussion, by his superior insight, into the real crux of the questions. I have seen him in his home, his delightful home, especially at Longport. He had a genius for friendship. I only wish that my words were equal to my thoughts and my disposition to do justice to him. As a teacher he was unequaled; as an association worker he was the great organizer; as an editor he was careful, accurate and painstaking; as a friend he was kind, cordial and helpful.

Dr. H. C. Wood, Jr., vice-chairman of the U. S. P. committee of revision, Philadelphia:

My father was an associate and friend of Professor Remington and I cannot remember the time when I did not know Professor Remington. I have seen him at various associations and I have wondered at his diplomatic skill in difficult situations, to which Mr. Mayo has referred. I have read his books and have sat at his feet and have marveled at the breadth of his scientific knowledge. I have visited in his home and have been charmed by his genius for hospitality. I have had the privilege of working with him for fifteen years on the U. S. Dispensatory and have more recently been associated with him in the work of the U. S. P. revision committee—privileges which I highly esteem. He was a great educator, statesman, scientist and friend. He is not gone; his spirit remains with us and will remain to inspire us as long as we are left.

Prof. E. G. Eberle, editor of the *Journal of the American Pharmaceutical Association,* Philadelphia:

It is difficult to speak of Professor Remington now; he is too near for the full worth of the man to appear. We who have known him intimately for many years have suffered a bereavement that we cannot speak of in words that are adequate, but time will bring this loss into evidence. What now might seem fulsome eulogy will be found insufficient to wholly express the true character and inexpressible loss to pharmacy by his death.

Frederick M. Davenport said, 'Let none suppose that any crowd of American college boys ever sat for one year or two years at the feet of a college professor without knowing the substance of that man. There is nothing human that I know of so near infallible as the final estimate that college men put upon an instructor.'

The graduates of the Philadelphia College of Pharmacy, with few, if any, exceptions, revere Professor Remington; there are not very many teachers who retain the continued friendship of the alumni as did Professor Remington. I knew him as a teacher and almost adored him, and soon after my graduation it fell to my lot to be associated with him in one way or another, and I greatly respected him; further years brought me into closer touch and I loved him as a friend.

At this time we can speak of him best by a survey of his activities, his relations with others, his leadership in pharmaceutical endeavor, which will give us a more unbiased judgment of the man than personal expressions that may be influenced by our deep sorrow. For half a century Professor Remington was identified with the development of pharmacy and during many years of this time, on account of his prominence, he was subject to the most critical judgment of his confreres and collaborators, and he stood the qualifying test of a competent leader and great man, which speaks more than any encomium possibly could.

Professor Remington was genial, most hospitable, amiable, forgiving. His happy humor, his kind and loving sentiments added charm to his wise, practical thoughts. A great American pharmacist has left our ranks; we have profited by his works and endured a loss by his death which will be more deeply recognized as time passes.

Dr. F. E. Stewart, chairman of the committee appointed from the Philadelphia Branch of the American Pharmaceutical Association, read the resolutions from that body, as follows:

IN MEMORIAM

WHEREAS, Almighty God, in his eternal wisdom, has taken from our midst our beloved brother, Professor Joseph Price Remington, we, the members of the Philadelphia Branch of the American Pharmaceutical Association, express our deep sorrow at his loss.

Professor Remington, whose death we mourn, was an international figure in the pharmaceutical circles of the world; in his death, pharmacy has lost its most prominent chieftain. As president of the American Pharmaceutical Association and one of the founders of the Philadelphia Branch; as president of the Pennsylvania Pharmaceutical Association; as chairman of many important delegations; as a member of numerous scientific bodies in this country and abroad; as professor of pharmacy in the Philadelphia College of Pharmacy and for many years its dean; as author of 'Remington's Pharmacy,' a textbook wherever pharmacy is taught; as chairman of the committee of revision of the United States Pharmacopœia; as joint author with Professors Sadtler and Wood of the United States Dispensatory, he occupied a position of unique distinction and influence. No man left a more helpful impression upon the pharmacy of the entire world than Professor Remington. In foreign countries, when the king dies the people cry, 'The King is dead; long live the King!' It is for us to cry, 'The King is dead; who shall reign in his stead?'

Resolved, That we spread this memorial upon the minutes of the Philadelphia Branch of the American Pharmaceutical Association, and send a copy of the same to his family in testimony of our sympathy and appreciation.

(Signed for the Committee)

F. E. Stewart, M.D., Phar.D.,
Chairman.

Dr. Stewart then added his personal appreciation of Professor Remington in these words:

I desire to express my personal feelings, not only representing the Philadelphia Branch of the American Pharmaceutical Association, but also representing the class of 1876, this class being the one to which Professor Remington gave his first course of lectures. During the many years since that time, there has hardly been a year that I have not had an occasion to personally confer with Professor Remington, and I was always received with courtesy and consideration. His loss is a great blow to us as members of the college and members of the faculty.

Prof. Charles H. LaWall, Professor Remington's associate in the department of the theory and practice of pharmacy at the College, then spoke as follows:

I am filled with such emotion in consequence of the events which have preceded this meeting that I can do but feeble justice to the feelings in my heart at the present time. I have been associated with Professor Remington for eighteen years, probably in a closer way than many of those who have preceded me. I have worked with him, I have traveled with him, and I have played with him, because he was one of those few men who knew how to play. So few men realize that to work well one must also take a certain amount of recreation. I have learned to know, love and respect him in a higher degree than I have had a respect and love for and knowledge of any other man in the world. I have been associated with him in a teaching capacity and during those eighteen years I have been a student at his feet, because one could always learn from him; he had such a boundless fund of information on almost every subject.

They say that he who influences the thought of his own time influences all eternity. Therefore, we know that the influence of Joseph P. Remington will go on forever, so long as pharmacy is a science.

There is another phase of his character that has not been dwelt upon, and which I knew very well. That is his cleanness of heart and soul. I never knew a man who had that innocent view of things for a man of mature years to such a degree as he had. He had that kind of cleanness that is contagious. I have observed him in gatherings of men and I have seen him enter the smoking compartment of a Pullman car, where sometimes stories are told that are somewhat *risque,* and without apparently exercising any conscious influence on the conversation, direct it into healthful channels, by his personal magnetism introducing a clean tone into the atmosphere. Therefore, I have always felt that he exemplified Kipling's phrase 'In simpleness and gentleness, in honor and clean mirth,' because if there ever was a man who was clean it was Professor Remington.

So far as his personal magnetism was concerned, everyone must pay tribute to that; it was his outstanding characteristic. He had the faculty of making friends of his enemies. 'Every pilot can steer the ship in calms but he performs a skilful task who can manage it in storms.' In piloting an association over the shoals of some apparently insuperable difficulty or some committee over the reefs of personal differences, he exercised his powers to the fullest extent.

Then followed Dr. C. B. Lowe, professor of materia medica at the college:

I have been pleasantly associated with Professor Remington for a third of a century, and during that time I have found him a kind friend whom I shall miss very much. I should like to paraphrase an author's lines, as follows:

"Dear friend, we've lived long together,
Through sunshine and through cloudy weather;
Say not "Good night,"
But in some brighter clime,
Bid me 'Good morning.'"

Prof. E. Fullerton Cook, associate director of the pharmaceutical laboratory of the college, voiced his appreciation as follows:

In paying tribute to the memory of my friend, Joseph Price Remington, I need not cite his achievements or his services to pharmacy. These you know. I might speak of his affable manner, his keen insight into character and motives, his courage in standing unwaveringly for what he thought to be right, his infinite pains to attain perfection in the work in hand, his strong sense of duty when responsibility was accepted, and of other notable qualities; but these are to-day builded into permanent record, into this college he loved, into the U. S. Pharmacopœia of four decades, into his own publications, and best of all, into the memories we hold. They speak for themselves.

The world I wish to give, therefore, is more personal; the impressions from an intimate relationship of many years, almost as close as that of father and son. One of the outstanding facts soon recognized was that Professor Remington was deeply religious. His Quaker training had left a lasting impression. In deciding small or large questions, he would frequently speak of 'waiting for the voice,' with perfect faith in its right guidance. This belief powerfully influenced his action and kept it true to high ideals.

Another quality which I believe I may speak of here, especially since at times he was misunderstood, was the entire absence of a spirit of revenge. He was not small in his dealings with men. Yet he was not weak or afraid, for if he believed a policy pursued by someone or a group of men was not for the best interests of the profession he did not hesitate to attack it, but he did it openly and without underhand or political pressure methods. To have it insinuated that he was unfair or had taken advantage of his position, hurt him keenly, and he would frequently go far out of his way to show special consideration to those who seemed to want to believe him unfair and in his official positions he voluntarily set for himself a standard of action which was above reproach and even considered extreme and unnecessary by some of those who knew his customs and convictions.

One of the charms of his personality was his appreciation of humor and his stories are repeated broadcast, but those who came into intimate contact with him were soon impressed by the elevated and moral plane upon which he kept his stories and his thought. He never sought nor liked it when tainted and never passed it along.

The passing of this brilliant life has left a vacancy hard to fill, yet one of his life passions and greatest pleasures has been to teach others and he went without a fear for the future of pharmacy, for he knew that thousands all over the world, 'his boys,' would carry on the work he loved. Thus his last and probably greatest lesson to us is that by giving one's self one may attain immortality.

Dr. S. P. Stout, a graduate of the college, spoke as follows:

I met Professor Remington frequently, especially during college days, but during the last three or four years I met him as man to man. The last time I saw him was in his home last spring. After we had finished our business, I said, 'I expect to go to war.' His face lighted up and he said, 'I would like to go with you. When I get rid of this "plumbago" (he jokingly called it that) perhaps I will be all right again.' I told him I was going in the Roosevelt Division, and he gave me a wonderful insight into Roosevelt's character.

I came to-day because I have a telegram in my pocket directing me to one of the military camps in a few days. I want to add my tribute. Such men as he have done and are doing a great deal to keep the professions of medicine and pharmacy on a high standard where they belong. President Wilson said we are entering this war to make the world safe for democracy. These men have toiled to make the world safe for professional men. There are too many charlatans and quacks who are trying to make gain out of the misfortunes of others. Many of you have to-day spoken of Maisch, Remington, Wood and Trimble. In the immortal words of Lincoln: 'It is for us, the living, to be here dedicated to the great task remaining before us, that from these honored dead we take increased devotion to the cause to which they gave the last full measure of devotion.'

Lastly, Professor F. X. Moerk, professor of analytical chemistry of the college, paid his tribute to Professor Remington:

My personal knowledge of Professor Remington dates back to the session of 1880–81, when Mr. Charles F. Kramer, then a senior student, took me to the college one evening, and I first saw Professor Remington and later Professor Sadtler, the lecturers of the evening. A few months later, a prescription was brought to the store in which I was employed, calling for an ointment of unknown formula, and I was sent to Professor Remington's store at 13th and Walnut Streets, for information regarding the same. While walking along 13th Street, my attention was drawn to a gentleman coming toward me, who I thought might be Professor Remington, if he had had a full beard. I addressed the gentleman and sure enough it was he. Upon explaining my errand, he stated that Mr. Charles Frederick Zeller, his assistant, would be pleased to give me the desired information.

In the fall of 1881, I entered the college and during my student career frequently consulted Professor Remington at the college and at the store and felt that he always took an interest in me. Since graduation, I have continuously held some position in the college, but during the past few years, since my appointment as assistant dean, I have been in close touch with Professor Remington, and during the many, many conferences which were necessary, not a harsh or cross word was uttered. I gladly join the other speakers in paying tribute to one who always upheld the interest of the college.

After the telegrams given below, which had been received by the College and Mrs. Remington, were read, the meeting adjourned, with sad hearts and a feeling that there was a vacancy in the scheme of things pharmaceutical that will be felt for many many years to come.

Telegrams Received by the College and Mrs. J. P. Remington.

The Secretary of the Philadelphia College of Pharmacy: The President and members of the Nova Scotia Pharmaceutical Society desire you to convey their sympathy to Professor Remington's family and friends. We have pleasant recollections of the Professor's visit to Halifax a few years ago, when we learned to esteem his personal qualities as highly as his professional. We unite with you in mourning his loss.

G. A. Barbridge, *Secretary.*

President Howard B. French: For the American Conference of Pharmaceutical Faculties, I express the sympathy of the colleges of pharmacy in the United States to you and the members of the P. C.

P., in the death of Professor Remington. He was the most magnetic personality of the century in American pharmacy.

HENRY KRAEMER, *President.*

TO THE FACULTY AND MEMBERS OF THE PHILADELPHIA COLLEGE OF PHARMACY:

Dear Sirs: I hereby express my sincere sympathy on the death of your dean, Professor Joseph Price Remington, a man who exemplified pharmacy in the United States as Hager did in Germany, and who always placed the interest of pharmacy above his own interest, and whose work will be a living monument to those who are inclined to follow his footsteps hereafter, and who personally always practiced and followed the Golden Rule, namely, "Do to others as you expect to be done by," and without being vindictive to those who differed with him at times. In Professor Remington's death a teacher has been lost who will be very hard to replace. Again expressing my sincere sympathy, I remain,

Respectfully,
GEORGE DECKER, representing
The German Apothecaries' Society of New York,
N. Y. State Pharmaceutical Association,
Alumni of the New York College of Pharmacy.

Prof. S. P. Sadtler: Serious illness prevents my leaving.

COBLENTZ.

G. M. Beringer: I regret that indisposition prevents my paying my respects to the memory of Professor Remington, who was my tutor in 1873 and my esteemed and respected friend for nearly forty-five years. His death is a sad loss to the pharmaceutical profession and to me a personal sorrow.

SAMUEL W. FAIRCHILD.

Mr. G. M. Beringer: The whole world grieves at the loss of its greatest pharmacist. The Atlanta College of Pharmacy will remain closed on Friday, the day of the funeral, as a token of grief and sorrow. Have notified all our papers.

GEO. F. PAYNE.

The Northwestern Branch of the A. Ph. A. express deepest sympathy in your bereavement.

CHAS. H. ROGERS, Minneapolis, Minn.

Mr. Charles H. LaWall: I want to thank you for the information regarding Professor Remington's death. It grieves me greatly that I am unable to be present at the memorial services of this really great man. Our alma mater has lost a faithful and potent son, whose geniality and influence brought her much renown. May the seed he has sown ever bring bountiful harvests.

LOUIS EMANUEL.

Mrs. Joseph P. Remington: The Meyer Bros. *Druggist* joins other pharmaceutical publications in extending you sympathy in your bereavement. Your late husband, Professor Joseph Price Remington, worked throughout his long life in promoting the welfare of pharmacy. This is a common cause with the pharmaceutical press.

HENRY M. WHELPLEY.

Mrs. Joseph P. Remington: The officers, board of trustees and faculty of the St. Louis College of Pharmacy direct me to express their sincere sympathy in your bereavement. Professor Remington was a personal and valued friend of this institution. The Professor honored us with addresses on several occasions.

HENRY M. WHELPLEY.

Mrs. Joseph P. Remington: The Minneapolis Retail Druggists' Association extend you our heartfelt sympathy in this time of your bereavement in the loss of your husband and father. The memory of Professor Remington will be cherished by pharmacists of the world, the fitting monument of his long and useful career as an educator.

HENRY RAUCH, Sec. M. R. D. A.

Mrs. Joseph P. Remington: The Minnesota State Pharmaceutical Association extends deepest sympathy to you and family during your hour of sorrow.

E. L. NEWCOMB, *Sec.*

Mrs. Joseph P. Remington: We loved and admired Joseph P. Remington, both for his splendid abilities and his personal charm. The world has lost its greatest pharmacist and we one of our most beloved friends.

GEO. F. PAYNE.

Mrs. Joseph P. Remington: With extreme sorrow announcement of your loss is received. A life full of good works, the death of our professor will be mourned by and mark a serious loss to American pharmacy.

H. LIONEL MEREDITH, Hagerstown, Md.

MRS. JOSEPH P. REMINGTON.

Dear Mrs. Remington: I am advised by the National Drug Trade Conference that owing to the fact of a very important meeting going on at the present time it will be impossible for these delegate members of that organization to attend the funeral of Professor Remington. Dr. A. R. L. Dohme has named as a Committee from the American Pharmaceutical Association to attend the funeral, Messrs. H. P. Hynson, John F. Hancock, S. L. Hilton, H. M. Whelpley and E. G. Eberle.

The National Drug Trade Conference and Dr. A. R. L. Dohme desire me to express their great sorrow and deep regret over your bereavement and to extend to you and all of your family these expressions of sympathy.

Respectfully,

E. G. EBERLE.

Mrs. J. P. Remington: My sincere sympathy. A great man has passed away.

FRANK G. RYAN,
Detroit, Michigan.

Regret I cannot attend services owing to serious illness of wife. Both greatly moved over loss.

V. COBLENTZ,
Long Branch, N. J.

Our deepest sympathy is with you in this hour of sorrow. May He whose love endureth forever solace you.

MEYER BROS.. DRUG CO.,
St. Louis, Mo.

Mrs. J. P. Remington: Extend to you and each member of your family heartfelt sympathy at this hour of bereavement. Regret that conditions of travel make it impossible for me to attend funeral. Have ordered a suitable wreath on behalf of American Conference of Pharmaceutical Faculties.

HENRY KRAEMER, *President.*

Mrs. J. P. Remington: Kindly accept the sympathy of the boys in the twin cities, who were students under Professor Remington at the P. C. P. Our hearts go out to you in this sad hour of your bereavement. Dean Remington is no more; the sympathetic voice which we all knew and loved is no more, but his spirit lives and breathes an inspiration to us all. The warmth of his last handshake will linger like a benediction until in that realm revealed to us by faith, we again join the hands of the spirit in the light of the morning that shall have no end.

Sincerely your friends,

E. L. NEWCOMB,
F. J. WULLING,
C. M. MCCOY,
H. H. GREGG,
C. T. HELLER,
W. D. KELLY,
F. E. ALLEN,
G. M. RUSSELL,
J. W. SMELTZER.

Mrs. J. P. Remington: Please accept my deepest sympathy in your sad bereavement.

CHAS. E. CASPARI,
St. Louis, Mo.

COMMUNICATIONS RECEIVED AFTER MEETING.

Prof. E. Fullerton Cook:

Desire to extend most sincere expression of condolence death of Professor Remington.

FLORENTINO LOPO FUNDORA.

Havana, Cuba.

DEPARTMENT OF AGRICULTURE,
BUREAU OF CHEMISTRY,
WASHINGTON, D. C.,
January Ninth, 1918.

THE TRUSTEES AND FACULTY,
PHILADELPHIA COLLEGE OF PHARMACY,
Philadelphia, Pa.

Gentlemen:

In behalf of the Bureau of Chemistry, and of myself personally, permit me to express to you the sympathy of the Bureau in the great loss that has come to your institution through the death of Professor Joseph P. Remington.

We, here in the Bureau, who have been working with him in his fundamentally important revision of the pharmacopœia have an adequate appreciation of his great services to pharmacy, to medicine, and to the country, generally. His loss will be felt far beyond the circle of his personal friends and colleagues.

Yours sincerely,
CARL L. ALSBERG.

ACTION TAKEN BY THE NATIONAL DRUG TRADE CONFERENCE.

In Memoriam

Professor Joseph Price Remington.

The funeral of the late Professor Joseph Price Remington occurred at Philadelphia, Friday, January 4, 1918, at one o'clock p.m. The National Drug Trade Conference, then in session at Baltimore, adjourned for two hours, out of respect to the eminent deceased; and upon reconvening at three o'clock adopted the following resolutions reported by the committee named by a standing vote.

Whereas, In His wisdom it has pleased Almighty God to take from our midst our distinguished and highly esteemed friend and fellow pharmacist, Joseph Price Remington, and

Whereas, The services which Joseph Price Remington has rendered the people of this entire country, the profession of pharmacy, the entire drug trade and the many thousands of young men who have enjoyed the privilege of being his pupils have been of unusual prominence, extent and excellence, and

Whereas, The Revision Committee of the United States Pharmacopœia has been especially benefited and assisted by his eminent qualities as leader and chairman during a period of over twenty-five years, and the American Pharmaceutical Association has enjoyed his wise counsel and sincere help and support as member, councillor and president, and

Whereas, The International Pharmaceutical Conference has for many years enjoyed the advantage and benefit of his varied experience and advice, and

Whereas, All the many interests and branches of pharmacy and the drug trade have by his demise suffered a great and irreparable loss, and his many thousands of friends in this country and abroad have lost and will sadly miss that ever-present and always encouraging smile and pleasant word which was so characteristic of Professor Remington and has smoothed over so many rough and stony spots in the life and career of his pupils and friends, and

Whereas, It seems incredible and difficult to conceive that his many friends, associates and pupils will never in this life again see the genial countenance and grasp the warm friendly hand of our departed friend, now be it therefore

Resolved, By the National Drug Trade Conference in meeting assembled on this the day on which his mortal remains shall be transferred to their last resting place in that city of brotherly love in which he has spent practically all his many useful happy years, that in his death, pharmacy and the drug trade and this Conference have lost one of their most prominent and distinguished representatives and friends, and be it further

Resolved, That this National Drug Trade Conference hereby gives expression to its feeling of sorrow at the loss it has sustained through his death and of sympathy with his family in their great bereavement, and be it further

Resolved, That a copy of these resolutions be spread upon the minutes of this Conference and as well that a copy be sent to the family of our deceased friend and to the pharmaceutical press.

Respectfully submitted,
DR. A. R. L. DOHME, *Chairman,*
SAMUEL C. HENRY,
R. C. STOFER,
JOHN C. WALLACE,
FRANK E. HOLLIDAY.

MEETING OF THE NEW YORK BRANCH OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

IN MEMORIAM.

CHARLES HOLZHAUER. JOSEPH PRICE REMINGTON.

The New York Branch of the American Pharmaceutical Association on Monday evening, January 14, 1918, held a memorial meeting in honor of Charles Holzhauer and Joseph Price Remington in the Lecture Hall of the New York College of Pharmacy. Elaborate arrangements had been made and the meeting was well attended by members of the Branch, prominent speakers and other friends.

The proceedings were opened promptly at 8:30 o'clock by President Mayer. In a few well-chosen words he explained the objects of the meeting and briefly reviewed the life and accomplishments of the deceased. He then introduced Dr. Henry H. Rusby, dean of the New York College of Pharmacy, as the first speaker. Dr. Rusby related his lifelong friendship with both Mr. Holzhauer and Professor Remington and his deep regret that pharmacy should lose two such men.

The next speaker was Edward A. Sayre, friend and neighbor of Mr. Holzhauer and admirer of Professor Remington. Mr. Sayre spoke at length of the fine qualities of Mr. Holzhauer, of his quiet demeanor and his philanthropic activities. He then paid homage to Mr. Remington, dwelling particularly upon his wonderful work.

Mr. Charles Schleussner was the next gentleman introduced by President Mayer. Mr. Schleussner, a classmate of Charles Holzhauer, related a number of interesting anecdotes of their college days and spoke of the shock he received when he heard of his friend's sudden demise.

Mr. Eugene Eberle, editor of the *Journal of the American Pharmaceutical Association,* then in touching words dwelt upon his deep admiration for the departed and of the great sorrow and loss to pharmacy which they left behind them.

Dr. Alfred Dohme, acting president of the American Pharmaceutical Association, was the next speaker. He spoke particularly of the aims which the departed Mr. Holzhauer was striving for when his regime as president of the American Pharmaceutical Association was brought to such a sudden termination. The speaker described the fine qualities of Joseph Price Remington, his work in the Association and his work in general.

A letter from Mr. George M. Beringer was next presented and read by the secretary. Mr. Beringer explained that due to an accident he greatly regretted being unable to attend the meeting. He enclosed, however, "An Appreciation of Professor Joseph Price Remington" and "A Tribute to Charles Holzhauer," which were read by the secretary.

AN APPRECIATION OF PROFESSOR JOSEPH P. REMINGTON.

In the death of Professor Joseph P. Remington, American pharmacy has lost its most renowned advocate and its most prominent teacher. No man has exerted a greater influence in pharmaceutical circles during the past quarter of a century than has this illustrious pharmacist whose earthly career ceased with the first day of the year.

Joseph P. Remington was in the truest sense of the term a "self-made man." Gifted by nature and with a laudable ambition, by personal effort and study he overcame the handicap of having been compelled, because of the decease of his parent, to leave the Central High School of Philadelphia without having completed the four years' course. His practical pharmaceutical training was under such prominent men as Charles Ellis and Dr. E. R. Squibb. His association during the formative period of his early manhood with many of the leading pharmacists of that time undoubtedly had a decisive influence upon his future career.

As the assistant of those pioneer teachers of pharmacy, Professors Procter and Parrish, he received an inspiration and as the successor of these eminent men it became his duty to develop their plans and ideals and to him must be accorded the credit of having firmly established the teaching of the theory and practice of pharmacy.

As a teacher Professor Remington was justly celebrated for his ability and success in that field of labor. During the nearly fifty years that he devoted to teaching pharmacy, he has instructed more students than have listened to any other teacher in that profession. His presentation of the subject matter of his lectures was always clear, the experiments and illustrations appropriate and very commonly the facts were driven home by some apt story or anecdote that made their retention more easy. He never missed an opportunity of impressing upon his classes the responsibility of the pharmacist and his students were thoroughly imbued with the ethics of their calling. Not the least important service that Professor Remington has rendered to pharmacy was through his personal contact with students. By his personality he won their esteem and enjoyed their confidence in a very large extent and was thus able to help them and to guide many over troublesome situations. His genial, kindly, fatherly advice has been of incalculable value to many who are now engaged in the drug business and by their example his influence will continue to be exerted on the oncoming generations of students.

Professor Remington's literary works are recognized as standard authorities. His editing of the pharmacy of the United States Dispensatory has been very satisfactory and his "Practice of Pharmacy," of which the sixth edition has recently been published, is deservedly the most popular textbook on pharmacy.

Possibly the most valuable public service of Professor Remington has been as chairman of the committee of revision of the United States Pharmacopœia. The advances made in the Eighth and Ninth Revisions were indeed marked, and a large portion of the credit for this is due to his indefatigable labors as the chairman. To fill this responsible position was no easy task and the trials and worriment associated therewith have doubtless shortened the life of the chairman.

He possessed to a remarkable degree the faculty of judging the character and ability of men and to understand their peculiarities and preferences. It was this ability to judge men and his study of his associates as well as his students that was in a measure the secret of his influence. It enabled him to enthuse his colaborers and to obtain their best efforts and therein was largely his success as chairman of the revision committee.

It was my privilege to enter college as a student under the professor in 1878, and later, as a trustee of the Philadelphia College of Pharmacy, I became more intimately acquainted with his work as a teacher. Later as a member of the committee of revision of the Pharmacopœia and in numerous other ways we were thrown much together and so I became even better acquainted with the work and spirit back of the man. It is a great satisfaction to know that he lived to complete these great life works and to learn of the appreciation of the world of his labors thereon. We can at this time feel only the great loss that we have all sustained in the decease of our captain.

"My Captain does not answer, his lips are pale and still,
My father does not feel my arm, he has no pulse nor will,
The ship is anchor'd safe and sound, its voyage closed and done,
From fearful trip the victor ship comes in with object won;
Exult O shores, and ring O bells!
But I with mournful tread,
Walk the deck my Captain lies,
Fallen cold and dead."

A TRIBUTE TO CHARLES HOLZHAUER.

At the first meeting of the New Jersey Pharmaceutical Association that I attended, it was my pleasure to meet Charles Holzhauer. His forceful manner and the logical and sound arguments that he presented in the discussions that took place attracted my attention and proclaimed him a leader. At each subsequent meeting of that Association and at the Annual Conventions of the American Pharmaceutical Association and whenever we would meet at other places we were much together. Our relations thus become gradually more and more intimate and ever closer and dearer to me became the bonds of our friendship.

The Creator implants in each human being an individuality, composed of both mental and physical attributes, which by development become the personality and make the character of that person and determine the fulfillment of his life's service and his contribution to the moral and material progress of the world. In Charles Holzhauer we had an exemplification of the personal development. During his life there were many unselfish services rendered to aid, encourage and to better the conditions of others. Many of these deeds were performed in a most quiet and unassuming manner, and though unknown even to his nearest friends, have been recorded with Divine approval.

In Charles Holzhauer there was a distinct, well-developed personality that always commanded respect and attention and ever won the esteem and admiration of his fellowmen and continually widened the circle of his influence. His interests were many and very varied and in all of these various associations, either in business, pharmaceutical or religious circles, while never seeking self-advancement, he shirked no duty and always accepted his full share of the responsibility and labors of each organization.

Pharmacy in America is yet, necessarily, a many-sided vocation calling for the exercise and development of different qualifications in accordance with the services required of the individual pharmacist. Charles Holzhauer personified the ethics of the business of pharmacy. Upright, conscientious, exact in all of his dealings, he profited not only financially but was especially rich in possessing the good will of his patrons and friends. His work and reputation will fill a peculiar niche in the archives of American pharmacy.

While possessing very positive views and holding firmly to his convictions, nevertheless, he welcomed the opinions of others and was anxious to learn the reasons of those who differed with him, and he was always fair in debate. He was a keen observer, cognizant of the frailties of human nature and with a broad experience with many men. He had a noble spirit, a generous nature and high ideals, coupled with a solidity of character and an unusually sound judgment. It was this "good sense" that made his opinions prized and for which his advice was so generally sought alike by associations as by individuals. It was this happy faculty, this ability as an adviser, that made him the leader among men, which was probably more noticeable in the New Jersey Pharmaceutical Association than elsewhere. In his kindly and generous way he dispensed his advice and frequently this was accompanied with material assistance. He was thus a "big brother" to many.

It is sad to realize that his desire to give one year of his best efforts as President of the American Pharmaceutical Association could not be realized.

If he had been spared to mature and to carry into effect his plans for the year with his usual energy, it would doubtless have been a great benefit to the Association.

The sudden summons, the hasty translation of the noble spirit of Charles Holzhauer was a severe shock and keenly have we felt the loss of this good man and true friend. We must, however, recognize that his aim in life, his example and what he strove for remains. Who can place an appropriate estimate on the value of his life so devoted to duty?

"The longer on this earth we live
And weigh the various qualities of men,
Seeing how most are fugitive,
  Or fitful gifts, at best, of now and then,
  Wind-wavered corpse-lights, daughters of the fen,
The more we feel the high stern-featured beauty
Of plain devotedness to duty,
Steadfast and still, nor paid with mortal praise,
  But finding amplest recompense
  For life's ungarlanded expense
In work done squarely and unwasted days."

[redacted]

Letters from Professor Virgil Coblentz and Professor Day expressing their deep sympathy were also read.

The next speaker was Professor Henry V. Arny. Professor Arny spoke of his admiration for his former teacher, Professor Remington, and of the irrevocable loss to pharmacy caused by his demise. The speaker contrasted the characteristics of the two men, emphasizing their common quality of loyalty and devotion to the American Pharmaceutical Association.

Mr. Clarence O. Bigelow then in a few words dwelt upon the many fine qualities of the deceased and upon his feeling of the great loss inflicted upon our profession.

Prof. Charles H. LaWall, president-elect of the American Pharmaceutical Association, was the next speaker. He related many interesting and appealing anecdotes of his close relation to Professor Remington. He spoke of the latter's last days at the Philadelphia College of Pharmacy and of his great work as chairman of the revision committee of the U. S. P. IX. He also spoke of his admiration for the departed Mr. Holzhauer.

Mr. Joseph W. England then read the following tributes:

[redacted]

JOSEPH P. REMINGTON.

When a man of the prominence of Joseph Price Remington passes into the Great Beyond, the impulse of those who knew and loved him is to pay tribute to his worth and work. The first is easy, because "out of the heart the mouth speaketh" and love finds ready expression; the second is difficult, because it takes time, and a long time, to properly estimate the full value of a life's work. It is very much like viewing a beautiful painting. Its real beauty can only be seen by standing at a certain distance from it and getting the proper focus. So it is with the work of a human soul. The future historian is best qualified to sense human values; the present-day observer is too close, too much influenced by the lights and shadows of personal relationship.

Therefore, I would speak of the worth of our departed friend, rather than of his work and its dominating influence upon American pharmacy. To know him was to love him. His charming personality, his fine tact, and his ability to make all those who came within the magic circle of his influence feel that here was a man and here a true friend—these were striking characteristics of him and they all "rang true." They did not spring from motives of policy. They came from a soul reared in a Quaker atmosphere full of love of humanity. He had his faults; we all have ours. To use an Irishism, the man who has no faults is not faultless; he has the fault of inertia. The strong, positive man is intensely human, and being human, cannot be perfect. The big thing is that such a personality inspires others to be kind, to be generous, to be considerate, to be friendly, to be helpful; and what is more, makes life better worth the living to countless thousands, as the influence of such a life spreads far and wide, like the ever-widening circles of a stream into which a stone is cast.

The outstanding features of Professor Remington's personality were, it seems to me, three in number—his unusual ability, his unusual force of character and his unusual courage.

His ability was inherited and acquired. He had a keenly retentive memory, and a fine, discriminating judgment in appreciating the relative values of facts. He was exceedingly painstaking in his consideration of details. He had a deep knowledge of the science of his profession coupled with rare executive capacity, an unusual combination of scientist and executive; and he knew, as no other, the possibilities and limitations of every active research worker in American pharmacy. He had practical experience in all the branches of pharmaceutical practice—the retail, wholesale and manufacturing, and acquired thereby unusual breadth of view.

His force of character was unusual. Strong and positive in his opinions, he was not hasty in forming them, and was tolerant of the opinions of others, and exceedingly patient. His anxiety was to be right in his decisions and to play fair with his opponents. He believed that might may win for the moment, but that right, eternal right, which is only another name for Truth, triumphs through the centuries. He never grew "stale." He always kept young by associating with young people.

He had unusual courage. At a meeting of the board of trustees of the Philadelphia College of Pharmacy held last spring, I asked Professor Remington as to his physical condition and expressed my sympathy. He replied: "I am near the end of my life!" He said this calmly and with a smile. He was "At the End of the Trail," as exemplified by the wonderful statue of that title at the San Francisco Exposition, typifying the final extinction of the Red Man—the Indian on a pony, both "all in," utterly exhausted, incapable of going further, at the brink of a precipice overlooking a dark valley. And the point is, he spoke of his "passing" without a trace of fear—with a smile on his lips and immortality in his eyes. He was unabashed and unafraid of Death, ready to go down into the Dark Valley and face his Maker! This was courage, real courage, unusual courage. And such a courage he exhibited time and time again in the crises of his life.

And now he is gone. "We ne'er shall look upon his like again." But the world's work must go on. American pharmacy has grown more during the past fifty years than ever before and it must grow still more during the coming years, or perish. Therefore, let us catch inspiration from the lives of such men as Procter, Parrish, Squibb, Rice, Maisch and Remington, and let each one of us do our utmost to promote the growth of American pharmacy in its best estate. We cannot all be leaders, nor need be, but we all can be workers, and if each one works to his fullest possible limitations—and no man really knows his own possibilities—God only knows—the future will be safe for sick humanity.

CHARLES HOLZHAUER.

There are men in every walk of life who are not conspicuous in the public eye and yet who wield unusual influence. They are the quiet, modest, unobtrusive, deep thinkers, with high ideals and excellent judgment, and enthusiastic in service—men whose opinions are ever in demand, men who mould public opinion. They are the balance wheels in organization-life, the men who hold the balance of power between the ultra-radicals and the ultra-conservatives, and make for constructive progress. Such a man was Charles Holzhauer, an honor to himself and a credit to his craft. He served his God and his fellowman with rare zeal and industry, and we all had deep affection for his genial personality and admired him for his sterling, upright character. He loved the American Pharmaceutical Association and all that it stood for. His life's work was like the man himself—honest, useful, industrious, successful, thorough and well balanced, and he has not lived in vain.

[redacted]

Mr. Runyon, lifelong friend of Mr. Charles Holzhauer and Prof. Joseph Price Remington, in touching words spoke of the great loss and of his deep regret caused by the deaths of his two friends.

Finally Prof. Jeannot Hostmann, chairman of a committee appointed to draw up resolutions on the death of Mr. Holzhauer, read the following:

IN MEMORIAM.

Charles Holzhauer has answered the call which has taken him to the great beyond. Actively engaged in retail pharmacy for over fifty years he leaves behind him a record of achievements well worthy of emulation. Honest, useful, thorough, untiring—are some few of the adjectives that may be truthfully applied to his life's work. He believed in the Golden Rule, and, believing in it, he lived up to it. He was devoted to his family, to his profession, to his church, to his associations—in fact, he was devoted to everything he was interested in and he was interested in everything that makes this life worth while. His advice, often sought and usually found sound, was born of a nature absolutely unselfish and noble. Well may we repeat the words of the poet,

> "To live in the hearts we leave behind us is not to die."

Insofar that the members of the New York Branch of the American Pharmaceutical Association wish to express their heartfelt regret caused by the taking away of their fellow member, Charles Holzhauer, be it

Resolved, That these words of appreciation be inscribed upon a page set aside in the minutes of this meetiing, and be it

Furthermore resolved, That the Secretary be instructed to send a copy thereof to the widow of our deceased member.

This concluded a meeting which will be long remembered by those present. It was an attempt to honor Joseph Price Remington and Charles Holzhauer, an attempt which proved a failure, for is it possible for any meeting of men to honor two such leaders as Remington and Holzhauer? Two such men who were so far beyond all? Is it not rather an impertinence for any organization of men to claim that they can possibly honor such super-men. No! The meeting proved simply to be a small touching attempt of emulators to express their admiration for Prof. Joseph Price Remington and Charles Holzhauer, departed Giants of Pharmacy.

HUGO H. SCHAEFER,
Secretary.

EDITORIAL.

A Great Leader has Passed Away.

In any calling comparatively few men reach the exalted position of national leadership. When such, however, has been attained, no matter what the sphere of activity, the world is ready to recognize superiority and to pay homage. True leadership carries with it great responsibility and the opportunity to accomplish some things noteworthy in the line of the leader's achievements and to add to the welfare and progress of the world.

America with its great natural resources, as yet, but incidentally developed, has been called the country of golden opportunities and offers in numerous avenues unequalled possibilities for achievements. Coupled with these possibilities there has been the pioneer spirit of "do and dare" unbridled by the conventional lines of caste and prestige that have been so prominent in the European nations. Consequently, we have had in this country many notable examples of success, evidenced by rapid accumulation of wealth or the achievement of influence, which we designate as leadership. America has developed her great men under different conditions and training than has held in any other country. Nevertheless, in every line of human activity our nation has developed some truly great men. Our statesmen, our military and naval commanders, our scholars, authors, and teachers, our physicians, surgeons, lawyers, and preachers, our scientists, inventors and discoverers, our artists, our actors, our captains of agriculture, industry or trade have all taken their places in the forerank with the leaders of other nations and by their work have added not only glory and renown to the United States, but have materially increased the sum of human knowledge and achievements and stimulated world progress.

American pharmacy, although associated with peculiar surroundings and conditions of medical practice that at times appeared to be hampering scientific progress, has, nevertheless, made noteworthy advances and is to-day holding up its end with the other branches of the medical profession. There has been developed a corps of pharmaceutical leaders whose professional labors and standing are universally acknowledged.

In the recent years, death has exacted an unusually heavy toll from among the leaders of pharmacy. No profession can well withstand the loss of men of the type of Hallberg, Wilbert, Caspari and Holzhauer and not suffer severely from the resulting disorganization. More appalling the loss, greater the disorganization, that will result from the decease of Professor Joseph P. Remington, who for many years has been recognized both at home and abroad as the commanding figure in American pharmacy.

Great leaders are not born as such. It is true that certain innate qualifications are essential, but to personal ambition and to personal efforts and developments must be attributed that success of an individual that continues to lead to advanced standing and greater influence until the goal of preëminence and acknowledged leadership is achieved. Back of all of these there must be ideals, predominant personal characteristics that point the path of progress, some perpetual spring of incentive as a guiding influence.

In the great leader whose recent decease we mourn and whose influence will extend through many generations of oncoming pharmacists, there were strong personal characteristics, some of which have been dwelt upon by his eulogists. There was, however, another well-spring upon which Professor Remington greatly relied that has scarcely been touched upon by his many sorrowing friends.

His faith in the power of prayer and his reliance upon Divine guidance and support was beautifully illustrated in an incident that occurred some years ago. We had been together one afternoon in a conference on an important question. That night, with the weight of the responsibility on his mind, he wrote to me from Longport: " I am writing this in the " sma wee " hours, but I must write you my impressions of the meeting this afternoon. You and I have a grave responsibility; we must work together. I know that you are accustomed to bear loads and that you do not trust to your own strength in your trials; neither do I; if I did, I would have been sponged out long ago. . . . Let us unite in prayer about this—I know that you look for strength from above—and this may sound strange from one whom you may have associated in your mind as thinking and believing in nothing but pharmacy—but I have for many years believed in special and definite supplication for guidance and I know that you do also."

This is only a glimpse at the inner man, the true Christian character, that shows the power that gave to him strength and endurance under most trying circumstances, and made him preëminent.

This additional tribute to the purity of his thought is due to that great leader of pharmacy in America who in obedience to the will of the Divine ceased his earthly career with the commencement of the year. G. M. B.

EVIDENCES OF BUREAUCRACY AND INEFFICIENCY IN GOVERNMENTAL DEPARTMENTS.

In the December number of the AMERICAN JOURNAL OF PHARMACY, p. 561, appeared an editorial headed "The Departments of the Government Need the Advice of the Drug Trade." If ever there was evidence that such advice is needed it will be found in the official "Manual for Army Cooks," issued as Document 564 of the War Department, from the office of the Quartermaster General under date of November 21, 1916.

The Manual, as a whole, is excellent and serves a useful and necessary purpose. The recipes and directions are apparently clear, comprehensive and practical. Minor defects doubtless occur in these, but which are negligible and excusable. The Manual contains definitions, as do most U. S. Army and Navy manuals, and it is in the framing of these definitions that the compilers or those immediately responsible for its preparation lay themselves open to ridicule and criticism.

What would have been easier than to ask the U. S. Department of Agriculture to assist in the preparation of such definitions as come within its scope? That would have been the proper course, the course prompted by efficiency rather than expediency and adherence to precedent, which seem to be the most potent influences for harm in all governmental department work. Such was not the course followed, however, as will be realized by a few quotations representing the gems of a collection of the most crudely drawn and incompletely worded definitions of which it is possible to conceive in a government document.

"*Aniline.* Dye used in highly colored confectionery. A product of petroleum. The red shades are harmless, but the chemicals used in making blue, green and other colors are injurious."

"*Comina.* An herb found in the southwestern part of the United States and in Mexico, much used in seasoning soups and stews."

"*Ferment.* A substance capable of producing yeast fermentation."

"*Glucose.* A cheap sugar that will not easily crystallize or a cheap syrup that will not crystallize—very much like "Silver Drip," but much thicker. Glucose is often made by treating cornmeal with sulphuric acid. It is very wholesome."

"*Mace.* The inner coating of the nutmeg. It is a good flavoring for meats, cream soups, puddings and sweets."

"*Oregano.* An herb much used in seasoning soups and stews."

"*Saffron.* The petals of a flowering plant of a deep orange color. Made into a tea and added to dough or stew, etc."

It is extremely probable, indeed the internal evidences are compelling, that the definitions were drawn up by a cook, probably one who had seen service on the Mexican border, for "Comina" and "Oregano" are Spanish names for cumin and marjoram.

Could anything illustrate better the evils that result from failure to coördinate and coöperate in the interests of accuracy and efficiency, than a perusal of the above? Could any argument be more powerful in favor of having all details in governmental work handled by those most familiar with them, than thoughtful consideration of the foregoing examples?

Perhaps a study of some of the other Departmental manuals would reveal similar defects, but it is not necessary to multiply instances to convince any intelligent person that the idea of omniscience that seems to obsess so many government officials could be replaced to advantage by a willingness and desire to do what is right and do it correctly.

C. H. LAW.

THE LABORATORY IN WAR TIME.

By Dr. Fred B. Kilmer, New Brunswick, N. J.

The editor has asked me to send him some notes upon the work of a pharmaceutical laboratory in war time. It might be tersely expressed by saying that the labors of the laboratory in these times are "just one thing after another." When one arrives at his post in the morning he may anticipate that almost anything is liable to occur before the close of the day.

When the war broke out there was a general scramble. Everybody began to buy, hit or miss. If a person had anything to sell he sold it at almost any price. There was at once a shortage of raw material—drugs, chemical supplies of all sorts, corks, vials, paper, ink, labels, tinware, lumber and, in fact, everything that went to make up the wares of the manufacturer. So great was this shortage that at times systematic collections were made from retail stocks, and manufacturers found shipments arriving at their doors consisting of boxes and bottles of all sorts and sizes and bearing marks of having passed through the stocks of the jobber and retailer.

This condition has forced the trial of numerous substitutes. The laboratory telephone is constantly ringing, and the voice at the other end reports no more of a certain article can be had and asks what can be done to keep the works going. Questions like these are puzzling to the laboratory. Substitutes are offered on every hand, but for most things there are no substitutes. The laboratory has to hold checks more than ever upon all raw materials. Materials which would be entirely rejected in ordinary times must be made to do, provided, as in many instances, they can be purified and made over. Then, with increasing tensity, we have been rationed. Glycerin, alkaloids, bleaching materials, anything and everything that enters into explosives or are in any way connected with war preparations have been cut down in supply or their use in commerce interdicted altogether.

Almost immediately upon the declaration of war the foreign countries placed an embargo upon most drugs and chemicals heretofore received from abroad, even chemicals and apparatus used in the laboratory for testing purposes. But the laboratory work had to go on. Embargoes have increased in kind and in quantity as the war progressed until at the present time they embrace even the containers in which goods are packed and the coal used under the boilers.

An interesting feature of the war has been the attempt to grow drug plants in America. Before the war manufacturers purchased their crude drugs from abroad and tons were piled up in their storehouses. When the supply was suddenly shut off, everybody said at once, "We will grow our own plants." They soon found that drug plants will not grow on paper or by word of mouth. At once there was an increased interest as to the source of the plants which supply our materia medica. We remembered that attention had been called, especially in the AMERICAN JOURNAL OF PHARMACY, to the decreasing supply of medicinal plants at home and abroad and we regretted that we had not heeded the warning.

In a truly American way everybody started in to grow drugs. The public press rang with extraordinary claims of imaginary profits to be made in the cultivation of drugs; fraudulent and irresponsible statements, much more detrimental than helpful, appeared in public journals. With the source of many crude drugs absolutely cut off, many manufacturers, through their laboratories, were forced back to the land.

Since the beginning of the war much interesting work has been done in the cultivation of such drugs as belladonna, digitalis, hydrastis, stramonium, aconite and others. It has not been an easy matter to make drugs grow in a climate and in a soil under conditions far removed from that which obtains in their habitat. Little if any relief could be expected from the agricultural interests, for drug crops are a specialized crop in comparison with food products, and are limited in demand. The user found himself forced to raise supplies to suit his own needs, irrespective of any consideration of the cost or yield. This is exactly what has happened. A few manufacturers here and there have fostered the growing of certain drug plants with interesting and most satisfactory results.

I can speak specifically only in regard to the cultivation of belladonna. Upon this plant much work has been done; many experienced horticulturists and agriculturists have in a small or a large way tried their hand; a number of manufacturers who use belladonna have put in a varying number of acres and for this and for some other drugs they have succeeded in preventing an actual famine. In belladonna cultivation very extensive observations have been made with a view of increasing the alkaloidal content, in other words, in producing a strain carrying a high percentage of alkaloid, and this has actually been accomplished in a limited degree.

In the writer's experience, however, a feature of our attempts along this line has been the careful selection by assay of individual plants, collecting the seed from those which attained a high percentage of alkaloid—in some instances specimen plants have reached as high as one per cent. This selected strain can be carried along for a few years, possibly three at the most, when it will revert back to a type giving a lessened amount of alkaloid.

Drug cultivation, to be carried on successfully, must be under the control of and in conjunction with the laboratory, in fact, it is my opinion that the whole question of the cultivation of medicinal plants is, and will be for some time to come, a laboratory problem. Study and investigation is needed upon the adaption and acclimatization of medicinal plants. The culture must be studied. Questions as to the seed, type of soil, influence of fertilizers, and cultivation must be answered. There must be developed methods of harvesting, curing and packing. The selection and breeding of medicinal plants affords a field for the widest scientific activity and gives some promise of being of great practical and economical importance.

Many other problems for the laboratory to solve have arisen out of the war. The cutting off of European supplies created a demand for new and unusual forms of products. These had to be met so far as possible. Then there arose embargoes against the exportation from the United States of goods containing specified drugs or chemicals, necessitating the formulation of products without the prohibited ingredients, shipments of which were made only to be sunk by sea-raiders or submarines.

Beginning with the onset of the European war and intensified by the introduction of the United States into the conflict, manufacturers were embarrassed by druggists who were overstocking, creating in many instances an unnecessary shortage of material. Many lines of goods which were supplied before the war in quantities sufficient to meet all needs have been entirely abandoned, and it is a question whether some of them will ever be revived. It is undoubtedly true that in many medicinal supplies we have had an unnecessary duplication with many superfluous commodities and preparations.

With the entrance of the United States into the war came the extraordinary demands from the government. By coöperation of the manufacturers, the government was induced to so change its specifications that manufacturers could meet its requirements with the facilities already in hand. The Council of National Defense rightly imposed upon manufacturers the duty of making war needs paramount, and the manufacturers met this with a spirit never before equalled in the history of the world, assuming the burden of attempting to produce millions where heretofore they had produced thousands. They changed their methods and increased their production without a question as to the ultimate outcome.

When the history of this war is finally written it will be found that the manufacturers of pharmaceutical products and allied lines are entitled to great credit for their loyalty, their quick and ready response, and for their efficiency in supplying the government requirements.

As a sort of return Congress has imposed upon the manufacturers a heavy and endless system of taxation—taxes upon their commodities, their profits, their capital, their incomes, their all. To the credit of these manufacturers let it be said that they have met these burdens most responsively.

Added to these complications have been enlistments and the draft making inroads on the laboratory staff and on the manufacturer's employees.

In the particular line in which I am interested the war has developed some era-making events. At the beginning of the war surgeons found themselves in strange surgical lands, witnessing unusual sights. It was necessary to cast aside previous experience and begin to learn anew. As a consequence surgical developments have revolutionized methods of treating infected wounds.

The mere magnitude of the campaigns, the conditions under which battles have been fought, the nature of the weapons employed, the unusual type of injuries, the great difference in the conditions under which medical and surgical treatment must be applied have given the practice in this war an entirely different face and it may be stated that the medical staff of all the armies of the world have met the situation.

This revolution of medical and surgical methods has called for many new appliances and preparations, or at least modification of the older forms. A goodly number of antiseptics and antiseptic preparations are among the products of this revolution. In fact, antiseptic treatment, or rather the prevention of sepsis by antiseptics, has received the greatest attention. A typical example of this is the well-discussed method of Dr. Alexis Carrel, who has evolved a method of treatment of infected wounds which bears his name. It has been stated by an English authority that the whole process of war surgery has been vastly improved by Dr. Carrel's researches.

The Carrel Method in its simplest form is a method of sterilizing wounds; a method in which an antiseptic solution is used. The solution, known as the Carrel-Dakin Solution, has been the subject of most extended discussion in medical and pharmaceutical journals. As worked out by Carrel and Dakin it is a specially made solution of hypochlorite. It has been the subject of a vast amount of misinformation in the journals and, as a consequence, many attempts to prepare it by following misleading formulas, and by those not skilled in the art of preparing such a preparation, have resulted in much confusion and at times disastrously. Indeed mixtures have been supplied under the name which are positively dangerous, and few have been supplied that absolutely fulfill the desired conditions of the originator of the method.

An accurately and properly prepared Dakin Solution, accompanied with Carrel technique, has accomplished marvelous results. On the other hand many solutions have been supplied that are useless or dangerous.

All this has thrown upon laboratories like that with which the writer is connected a vast amount of work. Thousands and thousands of experiments had to be made in order to evolve a process by which the correct so-called Dakin Solution could be supplied to the profession in a way that would meet the requirements of the Carrel Method.

Likewise out of the war has come the use of the paraffine films for the dressing of burns—apparently simple but really working out only after a long continuous struggle.

An interesting complication which has occurred in the writer's laboratory has arisen by reason of the scarcity of cotton fiber. When the war broke out cotton was literally a drag upon the market and everybody was besought to "buy a bale." Now it takes a good round bank account to buy a bale of the commodity which only a few months ago could be purchased for a song.

It is to be expected that there will be other commodities in which there will be a shortage, some of which will undoubtedly reach the famine point.

As we go on towards the close of the war we may anticipate increasing complications. There will be evolutions and revolutions and they may come thick and fast. The only thing to do is to be prepared to meet them. One thing seems evident—that some good will come out of the conflict.

Already we see indications of an improvement in the products and methods of American pharmaceutical manufacturers. The war has been prolific in lessons of retrenchment and simplification. American manufacturers are, more than ever before, self-contained. Drugs and preparations are becoming more and more standardized; there has been the securing of a uniformity in the methods of manufacturing, packaging, and in all things connected with the art. Many useless preparations have been eliminated and more will follow.

We can stand more and more of the movement which attempts to define what is essential and what is non-essential in our American life. We are learning more and more to eliminate waste, be it waste of energy, waste of raw material, waste in manufacture, or waste wherever it may occur. It seems to me that if there is one line of endeavor where laboratories connected with manufactories can prove their worth it is along the line of securing uniformity; efficiency in the methods of manufacturing; simplification of processes and details; elimination of waste and the conservation of energy.

A PROCESS FOR THE DEODORIZATION OF THE CRESOLS.

(Preliminary Paper.)

By James F. Couch, Washington, D. C.

The official mixture of the three isomeric monohydroxyl derivatives of toluol which is commonly called cresol is one of the more important antiseptics in common use. It forms the principal active agent in the pharmacopœial Liquor Cresolis Compositus and in the various trade modifications of that mixture and is, perhaps, the chief parasiticidal substance in the extensively used sheep dips. It is stated to be more germicidal than phenol and no more toxic while, in price, it has a decided advantage over its lower homologue. Cresol has proven highly satisfactory for many purposes; at present it is used in enormous quantities. The compound solution is to be found on every surgeon's shelf, in every hospital, and especially in the equipment of all veterinarians.

The great disadvantage of cresol which has prevented a still more extensive and varied use is the odor of the substance, which is intolerable to some and disagreeable to most people. If this factor were absent the substance might be advantageously used in a number of products and in processes from which it is now barred. It might be employed for the disinfection of dairies, for instance, without danger of communicating its odor to milk or butter.

Another disadvantage lies in its insolubility in water, which necessitates the addition of a soft soap to hold the cresol in solution. There are two objections to this addition of soap. The cost of potassium soaps is now excessive and sodium soaps are not as efficient emulsifiers in this case: the presence of soap in the solution causes a milkiness when the compound is diluted with a water which contains calcium salts. This milkiness is particularly undesirable.

In view of these facts it was thought desirable to investigate the possibility of removing the odor without decreasing the germicidal powers of cresol. It was found that this is possible and a process is described below by means of which this end may be attained.

Equal weights of cresol and concentrated sulphuric acid are slowly mixed in an earthenware or glass vessel when considerable heat is evolved. Mix thoroughly and heat at a temperature between 75 and 110 degrees C., preferably on a steam or water bath, although there is no objection to direct heat providing the temperature is kept within the limits stated. The heating is continued until a drop of the liquid mixed in a test tube with water shows only a faint cloudiness. If any separation of oily drops occurs the heating must be continued, unless it is known that the cresol contains a large proportion of hydrocarbons. The length of time necessary for the completion of the reaction varies with the quality of the cresol taken but will not exceed fourteen hours and, with good grades of cresol, is six to seven hours.

When this stage is reached the reaction product is to be mixed with five volumes of cold water and need not be cooled before being added to the water. If any oily matter separates it should be removed. The diluted mixture is neutralized with milk of lime and allowed to stand for twenty-four hours to allow the calcium sulphate to precipitate. The clear liquid is decanted off and the sediment is washed, the washings are added to the main portion of the liquid. This is now evaporated to dryness on a steam or water bath. Direct heat is not permissible, for the compound burns easily with the regeneration of the cresol odor. The dry residue is dissolved in a little water and tested for odor. If an odor still persists it must be evaporated again to dryness and again tested. This procedure is necessary to get rid of naphthalenes and pyridines, which are frequently present in cheaper grades of cresol and which are strongly odorous. When the residue shows no odor on solution in water it is diluted with water to twice the volume of the cresol originally taken and the calcium is precipitated by sulphuric acid. This must be done very carefully to avoid even the smallest excess of the acid in the solution. It is better to leave a small amount of calcium unprecipitated than to have an excess of sulphuric acid present. The mixture is allowed to stand a day and is then filtered, the residue being washed and the washings added to the main filtrate. This may then be adjusted to any desirable volume or weight. If desired, a sample may be analyzed for calcium and for sulphonic acids in the ordinary manner and the proportion of active matter calculated as meta-cresol monosulphonic acid after subtracting the amount of sulphuric acid present as calcium sulphate; from which data a standard strength may be adopted. In practise, however it is easier to make the solution up to the same volume as the cresol originally taken occupied.

In this way there is obtained a golden-yellow liquid with at most a faint odor of leather but absolutely none of cresol, naphthalene, pyridine, or other disagreeably smelling substances. In reaction it is very faintly acid.

It consists of a mixture of the monosulphonic acids of the three cresols of which acids six are possible and probably are all present in varying proportions. As they are very soluble in water it is difficult to obtain them in crystalline form and it would be nearly impossible to separate them one from another. The relative power of these compounds against the lower forms of vegetable life has not been determined, so that I cannot state what proportions of them would be most effective. A preliminary titration of the deodorized cresol against *B. coli* has, however, shown that the phenol coefficient of the solution is considerably increased by the chemical treatment. Further investigations on this point against other organisms and experiments to determine the relative toxicity of the deodorized cresol towards higher animals are in progress and will later be reported.

Since no addition of soap is necessary in this formula and the calcium salts of the acids are all soluble in water the compound will not become cloudy when mixed with hard waters. This is decidedly an advantage over the official solution. The elimination of the soap as an ingredient further makes it possible to prepare the deodorized solution at a much lower cost. It may be employed in all cases where the official compound solution is now used and with as great effectiveness in the same proportions.

THE METRIC SYSTEM AND INTERNATIONAL STANDARDIZATION.[1]

By Herbert T. Wade.

Those who have observed the industrial and commercial changes that so far have taken place in the countries affected by the war have remarked the progress that has been made towards policies of more general standardization, not only as regards munitions but with a large number of articles, materials, and machines for general use. Such a policy not only is required by enforced economies, but also is in line with ideas of modern mechanical efficiency. The conclusion of the war will find firmly intrenched in many countries a certain number of standards and policies of standardization, so that in the replacement and manufacture of the various commodities required, there will be inevitably an increased conformity to standards, yet at the same time there will be a most apparent lack of single and uniform standards. While the question of international standards is now figuring to a greater extent than ever previously, and a more general conformity to such as are or will be established is inevitable. yet it must be considered also that international standards should be the best standards. As a result today international committees are conferring, and in all branches of mechanical, industrial, and commercial activity, the feeling is becoming general that international standards must be established and a general conformity thereto observed.

Any policy or system of standardization must be based on a fixed and determined system of weights and measures and therefore it finds an important place in any discussion of the metric system. However, it envolves far more than a system of units of weights and measures; it implies the fixing of sizes, of physical and chemical characteristics, of methods of packing and transportation, and of absolute and relative efficiency, and in fact any and all attributes of the articles and materials which figure in trade. and industry, and in regard to which a number of minds can unite to formulate a definite description or specification. Let us consider a few examples. There are the standard units of length; the International Meter and the British Imperial Yard, and the subsidiary units and standards of length derived from them; there are the kilogram and the various pound standards; there is the standard of illumination, the candle-power; there is the standard bushel of grain or vegetables; there is the standard bale of cotton or barrel or sack of flour; the standard specifications for cement; standards for petroleum products; standards for railway materials; and in short standards for numberless articles and materials that figure in science and industry. In these standards, selected at random, and in the case of numberless others that could be mentioned, there are two important points to be appreciated. First, that an essential element of the definition or specification is one or more units of weight or measure; and second, that the standards familiar to us are but rarely arranged on a basis of harmony and logical interrelation either with each other or with any special system. For this reason in considering standards in their almost infinite variety, comparatively few will be found that have international application, or that have been established on some scientific basis, or deduced along logical or universal methods. Yet such standards are unquestionably demanded and must be provided for international use, and in proof of this statement one has only to consider the industries where efficient and international standards are observed and compare them with those where such a condition does not exist. Accordingly, to formulate and establish standards that will secure universal availability and application, is today an industrial duty of prime importance. Indeed it is largely with this object that each large industrial nation maintains a national bureau of standards or some similar institution for technological research in which problems of standardization are an important function.

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[1] A paper presented at the annual meeting of the American Metric Association, held in Pittsburgh, December 28–29, 1917.

The prime qualifications of standards must be that they are fundamental, invariable, logically developed, readily understood, and universally accepted. Where there is a meeting of the minds of those concerned as to the general and determined nature of the product, standards can be established irrespective of the fundamental units used in their determination. Such standards, however, cannot be the best and universal standards, unless they are based on principles universally understood and logically developed. Accordingly therefore, it is necessary at the outset to consider all policies of standardization with regard to the fundamental units, and the fundamental systems of units which underlie their determination.

It is in this respect that the metric system finds special application and, what is more, it must be considered as a prime essential of every system of international standards now or later to be established. Today minute and precise measurements and exact determinations practically invariably are in the metric system or are related to it, because that system is the universal and only system of the scientist and investigator. This is the case because workers in pure and exact science long since have appreciated the advantages that not only are appropriate to the metric system itself, but are characteristic of an international and interchangeable system of weights and measures. Inasmuch as any system of standards must depend upon exact determinations and precise measurements, and as the units, standards, and methods of such precise measurements and determinations employed by the scientific man are metric, it is inevitable that they should figure in the initial and basic work in practically all cases, whatever the nationality of the investigator.

This is true not only because the metric system is the system of the research laboratory, but because it is known and understood by engineers and technical men the world over. Furthermore, the special advantages of the metric system must be considered in relation to problems of standardization. It is the simplest system, starting with fundamental units of length and of mass. It is represented by appropriate standards of the highest scientific integrity and invariability. It is a complete and comprehensive system, for all forms of measurement can be developed, and it can be utilized in the definition of all forms of standards without recourse to arbitrary units or standards. And while the work of the metrologist involving, as it does, measurements as minute as the wave length of light, may seem but little related to the ordinary processes of manufacturing and engineering, yet the character of the prototype standards representing the units and the secondary and subordinate standards through which the general accuracy of any system of weights and measures is maintained, is by no means negligible. In the international metric system, the original standards have been determined and established as regards their accuracy, invariability, and permanence with greater precision than those of any other system, and what is more, they are interrelated with various national and other standards by the most intimate connections possible to modern science. The superiority of this interrelated system of metric standards to all others and especially to the Anglo-Saxon standards is so great that officially in the United States since April 5, 1893, the customary units are determined by their relation to the metric standards, and not by a direct comparison with other standards of the same names, derived from Great Britain or elsewhere. This is a simple metrological fact. The international metric standards today represent with greater accuracy, invariability, and interchangeability, the abstract or ideal units of length and mass related to any and all other units of length or mass by some mathematical ratio than do any yard, gallon, or pound, or other standards. In other words, in the present condition of metrological science recourse must be had to the metric system for fundamental standards whatever the system of measurement, and today in the interest of precision all arbitrary standards of various systems must be defined in metric units.

Now the standards and the definitions prevailing in any industry may seem to the ordinary manufacturer, producer, or builder, very remote from his daily problems, and the fundamental standards of a system of weights and measures may be close to the vanishing point in the perspective of the worker, but it must be impressed that the connection must be maintained unbroken, and that where there is uncertainty as to standards or where there is variation, accurate work and interchangeability cannot be maintained. Naturally as a process becomes more general and universal, the exact correspondence with the standard grows less, but interchangeability is secured so long as proper limits of tolerance are not exceeded. A single standard properly defined and with tolerance limits stated makes for complete interchangeability in an industry or product.

It may be objected, that in the foregoing argument the order of the ordinary industrial process has been reversed, and it has been sought to derive standards for articles in common use from the refined fundamental standards of the scientists which possess a theoretical rather than practical interest. This in part may be admitted, and in part denied. In the older industries where there have been developed policies of standardization, this standardization came usually as a result of temporary needs and minimum adjustment, secured by small concessions or enforced conformation to the sizes and styles of one or more large manufacturers. In some industries in various countries, these systems have been developed with care and have served local or national needs. Now it is inevitable that where systems have developed in this way, they should become distinctly national, and their international acceptance is conditioned solely by the foreign trade of the country of their origin. As a result when several of these systems of standards come into competition, there is practically as bad a condition as if everything was specially designed and constructed without any pretense at standardization. Possibly any one of the various systems would answer were it possible to eliminate national and commercial prejudice and conform to it, but with the experience of all, it is safe to say that none is an ideal system.

Now as efficiency in all fields of activity is a ratio between the actual and the ideal, so in determining a standard we must aim as close as possible to the ideal. Consequently, the problem usually is to evolve an ideal system based on experience, but not necessarily confined to the practice of the past. In evolving an ideal system, it is not infrequently desirable to start afresh and utilize the various advances made in science and industry, since the former system or systems were developed on a fixed basis. It may be that in a battle of the standards one system may occupy such a predominant position as to warrant its international adoption. On the other hand, there can be little, if any, general approach to a complete standardization until entirely new standards are evolved by careful investigation of the conditions, scientific, technical, and economic. In such a case whatever the material or article may be, the aim at the very outset should be to secure an international and ideal standard, in which the best technical and commercial knowledge of the special art or industry concerned the world over should unite to secure the desired end.

Now unless any new or improved system of standards intended to be permanent is to be scientific (*i. e.*, exactly defined and specified, interrelated, and interchangeable) and international or susceptible of international use, there is but little advantage to be gained by its establishment, particularly at this time. Scientific accuracy is the keynote of industrial progress, and international trade is the field for future commercial prosperity. Consequently, as an essential in either case, standards defined in the metric system are essential.

It may be noted that the word *defined* is used, and at the present time, this should be borne in mind. Given an exact definition and knowing the ratio of different systems of weights and measures, articles or materials can be *made* in any system. Modern industry works to gage not to measurement, and will conform to any standards that can be defined.

The product must be adapted to the needs of the consumer, so if these needs can be standardized, the markets of the world are thus opened.

Weights and measures have furnished a barrier between countries which partly can be overcome by cumbersome processes of conversions or equivalents, for the reduction of one system to the other, but sizes, styles, and qualities must conform to the usage of the consumer who will purchase where his requirements will be met. Therefore, it is necessary to consider all interests in this general policy and educate all to the advantages of common standards. International weights and measures must be the point of departure for any system or systems of international standards, and to secure the fullest and speediest realization of such international standards, the way first should be paved by the adoption and use of the metric system.

No longer are we living in the past, and owing to the war the great nations are so interrelated that in order to settle their financial dealings and their international indebtednesses, there must be the freest possible commerce. For the United States of to-morrow, the home market will no longer suffice, while the vast sums owing to America by Europe must be repaid in large part by commodities, crude and manufactured.

Now whatever the system of weights and measures in use in a country, there is inevitably progress towards standardization on some convenient basis. This naturally is a tendency of commercial civilization and is influenced by such consideration as the state of commercial evolution attained, and the ease of interchange of ideas and materials, that is telegraph, telephone, and land and sea transportation.

As distinct from international standards, it is inevitable that any less complete system of standardization will be based on local customs and practice, and there are likely to be as many systems of standards, as there are systems of weights and measures. Consequently, to secure harmony of standards, harmony and universality of weights and measures first must be secured, and the result is inevitable. Typical of this may be cited the case of electrical units and standards for years truly international and so maintained by international agreement. But here standardization has gone much further than mere units and definitions, for an international electrotechnical commission regulates international standardization, while standards committees of Great Britain and the United States are seeking to secure the fullest possible measure of harmony even to a fair degree of detail in the standards and practice of the respective countries, quite apart from the question of fundamentals.

In brief then, our argument is that there is need of national standards where no standards exist, and of international standards where the separate countries have their own independent systems. In the present condition of industry, standards must be determined by practical men used to mass production or large-scale construction, working in coöperation with scientific men skilled in precise measurement, systematic research, and logical methods. Now to the so-called practical man of intelligence, and especially to the trained engineer, metric units whether used or not are at least familiar, and the advantage of exact definition to which they lend themselves, if not apparent, can be explained without difficulty. Consequently, it is most reasonable to ask that where manufacturers or others are formulating standards, that these be defined in the metric system, first, on the score of exactness of scientific statement; second, because of the wide range of the units of the system, and third, because American standards thus defined will be understood by the world at large.

As soon as all the materials of the world's industries are defined and measured in one and the same units, there will be an advance towards a more general standardization, and world's standards soon will be evolved. With international standards duly established, a manufacturer could then produce for a foreign market without any special changes of equipment or of types of product, and at the same time any surplus over that required for home consumption could be more readily disposed of abroad, if made to a standard that would meet also the requirement of distant nations.

Likewise in the event of a shortage of material in a home market, a consumer could draw his supply from abroad; provided he knew that the articles were truly standardized and in useful sizes and qualities suited to his needs. In other words, there would be established a world market for commodities, raw and finished products, once there was in universal use a single set of weights and measures to determine quantities exactly, and beyond the danger of misunderstanding.

It properly might be asked here why the metric system alone can promote this development of world standards and world trade. The answer is, that to-day it is the only international system and that it is single and invariable. In the first place, it is the one and only system of science and exact measurement in every nation of the earth; and second, it is known and recognized in every civilized land whether it is used commercially or not. It is true that for certain articles and commodities, there are excellent and carefully observed standards based on Anglo-Saxon and other measures in Great Britain and the United States, but in few cases are these standards international or universal, or even interchangeable in the two nations, and not always so in even one of these countries, and its dependencies. There are differences in tons and hundredweights, in gallons, bushels, and quarts, in wire gauges and screw threads, in paper sizes, and structural shapes. Consequently there are many differences in sizes, quantities, and other standards inevitably based on the above, as well as those due to national and special practices. If international harmony and universal sizes and quantities are desirable, there must be secured agreement not only between International and Anglo-Saxon weights and measures, but first between the latter and the standards based thereon, as used in the various countries by which they are employed. Of course, if a manufacturer or merchant, or the citizens at large, of a country, wish to take a provincial view of the matter of foreign trade and international standards, or even of national standards, then there is nothing to be said, and each nation may endeavor to defy the spirit of progress in a vain attempt to force its own wares or its special exports on foreign nations. But in our changing industrial and international relations can any single nation to-day look forward to possessing such power ten years from now?

Those who advocate and urge the early adoption of the metric system in the English-speaking countries are firmly convinced that in no way can this important movement of international standardization and the cause of broadening international trade be more aided or further advanced than by its general establishment and use. It is with confidence that they can claim there will result no mechanical chaos, industrial confusion, or commercial disorganization. In fact, such claims are made upon the premise that metrological reforms, like industrial and mechanical progress, are distinctly evolutionary rather than revolutionary and represent advances toward the efficient and ideal. It is no more possible to abolish the employment of arbitrary weights and measures, or the use of unstandardized articles, by executive decree, or legislative act, than it is to eliminate inefficient machinery by such a process. But the way can be pointed toward an ideal system, its introduction may be facilitated by wise statutes, and its general use established in such a manner as to convince all of the inevitable advantages that soon will result.

The metric system is not urged in connection with this movement for international standards with the idea of immediately displacing standards that have demonstrated their universality and their usefulness. Those standards can be defined and expressed in metric measurements even when they have not been developed along metric lines, but it is inevitable that where new and better standards must be determined or evolved, and especially an ideal and universal system, the metric system only should be used and should figure in the definition.

A temporary duplication of standards is but a transient evil, for one is bound to disappear and the ideal and international will prevail in a short space of time. That it will has been the verdict of industrial history the world over. Two standards can no more exist side by side than can two systems of money, and the inferior invariably gives way to the better. Is the metric system of weights and measures a better system? That is a question that has been affirmatively answered by scientists, by those who have had experience with other systems, as well, and finally by the undisputed record of the industrial progress of the nations by which it has been adopted. Consequently, if the same care is exercised in fitting mechanical and industrial standards on this basis, can there be any doubt that there will be not only international standards but the best standards from every standpoint? The expense involved will be small, but the returns will be great, returns not only material and substantial, but making for the highest development of industry and civilization.

METHODS OF MAKING SOYA-BEAN OIL IN MANCHURIA.[1]

Two processes are employed at Dairen for making oil from soya beans. One, known as the "extraction process," is a chemical method which, by the use of benzine, extracts the greatest amount of oil from the beans. When it is employed, not cake but bean meal is produced, and this is said to be preferred to cake for fertilizer, as it requires no breaking before it is used on fields. The oil, however, is said to sell for less than that produced by the "expression process," as it is difficult to remove all traces of benzine from the oil. The term soya-bean oil is generally understood to mean expressed oil.

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[1] Abstract of Report of A. A. Williamson, consul, Dairen, Commerce Reports.

Fifty-odd mills, large and small, are using the expression process at Dairen. Usually they are open to inspection upon proper introduction. Vertical presses of four columns of about 25 cakes per column are used, some mills having double presses—presses on two floors, one directly above the other and built as one machine, with the power applied at the same time in one operation. It is customary to work these presses by hydraulic power. They are displacing the old hand-power screw press.

When the beans are received at the mill they are generally frozen or very near it. After being sifted to remove such matters as stones, dirt, etc., they are kept for several days in a warm room, where they are turned over with shovels and thoroughly mixed from time to time. No magnetic cleaning is done at any of the mills except the chemical mill, which additionally uses this method. No particular temperature is aimed at, the object being simply to warm the beans so that the oil will be more easily freed. After they have been warmed for several days they are conveyed to the top of the crushers and run down through a series of cylindrical, smooth, or nearly smooth, iron rollers, which roll, not grind them. They emerge as disks, the size and shape of a dime. They fall from the rollers into a trough in which a screw conveyor is turning, and conveys them to the pressing floors, where they fall into bins.

The press gangs have ready squares of gunny-bag cloth, each of which holds a sufficient quantity of rolled beans to make a cake. The required quantity is scooped up and put into the cloth, which is then carried to the steam box. The cloth is spread out over the steam box, with the beans a couple of inches deep, and the steam is turned on and allowed to flow up through the mass for two or three minutes. The steam is not under pressure when applied, but escapes into the room, and no particular degree of temperature is aimed at, a thorough steaming being all that is desired, with the warming attained at the same time.

Meanwhile several more coolies, who work naked or with a loin cloth and sweatband only, have prepared the form. This consists of an iron plate with two handles, upon which two iron rings, which will form the cake, are placed, and two bundles of long grass imported for the purpose from China are spread fanwise. Then a thin, wooden, circular frame, with ends not fastened together, is placed on the grass and forced down upon the plate inside the rings, the grass ends standing upright.

The steamed beans are brought from the steam box in the gunny cloth, and with one swing thrown into the form. A coolie, shod with the native footgear resembling a moccasin but heavier, jumps in, grasps a handhold overhead, and stamps the beans into a compact mass inside the form. He then stoops and raises the wooden holder slightly, pulls up the iron rings to their proper position, steps out, takes out the wooden frame, folds over the grass ends to form the top of the form and lays two flat iron bars thereon to hold the grass ends in place. Then two men take plate and all to a small auxiliary press where gentle pressure, sufficient to set the mass, is applied for a second or two; the plate with the cake on it is taken to the press; the cake shoved off the plate into one of the columns forming; and the plate brought back for another trip.

As soon as the press is full, top and bottom, a wooden post is inserted at the outer side to keep the cakes in position, and the signal is given to the engineer, who turns on the hydraulic power. The bottom of the press rises slowly and the oil immediately begins to flow. The first pressure is not great; and as the first flow subsides, more power is applied, but time must be given for the oil to run before much pressure is used. After several hours pressure, the oil having ceased to flow even after the maximum of 130 tons per 100 cakes has been applied for a number of hours, the press is opened, and the cakes are taken out and stripped of the iron rings with instruments similar to peavies. The grass also is removed. Coolies take the cakes between their knees, and rolling them forward in the operation, cut off the rims (the part squeezed out between the iron rings) with drawknives. This finishes the cake, which is then ready for storage and shipment.

The oil flows by gravity from the presses into receivers, from which it is pumped into storage tanks. It is first strained, and in the tanks it settles, and is drawn off so that the sediment is not taken with it. Tanks are cleaned frequently and have pipes to draw off sediment. No fuller's earth or clarifying clays are employed, nor is any other conditioning method used.

PHILADELPHIA COLLEGE OF PHARMACY.

Minutes of the Quarterly Meeting, December 31, 1917.

The quarterly meeting of the members of the Philadelphia College of Pharmacy was held this day at 4 P.M. in the Library, the President, Howard B. French, presiding. Seventeen members were present.

The minutes of the semi-annual meeting held September 24 were read and approved.

The minutes of the Board of Trustees for September, October, and November were read by the Registrar, J. S. Beetem, and approved.

The Secretary reported the death of Fred. F. Muller on June 29, 1917, at Los Angeles, California. He joined the college in 1870. Also the death of Doctor Charles T. George on December 26, 1917, at Harrisburg, Pa. He joined the college in 1895.

The resignation of Samuel C. Henry from membership in the Board of Trustees was presented, and, on motion, accepted with regret. Mr. Henry has removed to Chicago, to accept the secretaryship of the National Association of Retail Druggists.

Mr. George M. Beringer on behalf of Mrs. Charles H. LaWall presented to the college a photograph portrait of Professor LaWall, which was accepted and the thanks of the college voted to Mrs. LaWall.[1]

The President appointed the Committee on Legislation as follows: Theodore Campbell, chairman; Joseph P. Remington, William L. Cliffe, W. H. Poley, Richard H. Lackey and Charles H. LaWall.

C. A. Weidemann, M.D.,
Recording Secretary.

Minutes of the Special Meeting, January 2, 1918.

A special meeting of the members of the Philadelphia College of Pharmacy was held this day at 4 P.M. in the Library. About 40 members were present. The meeting was called to take action on the death of Professor Joseph P. Remington, which took place on the morning of January 1, at his city residence, 1832 Pine Street. Street.

President French in opening the meeting said that since the call for this special meeting was issued it was thought best to adjourn this meeting and to hold a memorial service for Professor Remington on Friday afternoon, January 4, at 3 P.M., following the funeral services that would be held at Holy Trinity Church at one o'clock of that day. He had been informed that many of the friends and associates of Professor Remington from different parts of the country would be in the city to attend the funeral services and these would be glad to have the opportunity to attend and to express their appreciation, to testify to the loss they and all of us had sustained by his death.

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[1] For reproduction see this Journal, January, page 42.

Mr. Mulford moved that we adjourn to 3 P.M. of Friday, January 4, and that a committee be appointed to draft appropriate resolutions to the memory of Professor Remington, and that a suitable notice be issued for the meeting. After remarks on the motion by C. Stanley French, Professors LaWall and Cook, it was agreed to.

Professor LaWall moved that the entrance to the college be draped in mourning for the space of thirty days. Agreed to.

The President appointed the following members as the Committee on Memorial Resolutions: Joseph W. England, chairman; H. K. Mulford, Samuel P. Sadtler, Charles H. LaWall, J. W. Sturmer.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

MINUTES OF THE ADJOURNED SPECIAL MEETING,[1] JANUARY 4, 1918.

The following invitation was mailed to members of the College, members of various pharmaceutical organizations and to the friends and associates of Professor Joseph P. Remington.

"You are respectfully invited to attend an adjourned meeting of the College, at which will be conducted a

Memorial Service

in memory of the late

Professor Joseph Price Remington

on Friday afternoon, three o'clock, January fourth, one thousand nine hundred and eighteen, at the Philadelphia College of Pharmacy.

About two hundred persons were present when the President, Howard B. French, called the meeting to order. He said the College had met in special session on Tuesday, January 2, to take action on the death of Professor Remington, but had adjourned after a very short session and arranged for this memorial service to-day.

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[1] A complete report of this meeting is published on page 79.

Telegrams were then read from George F. Payne, of Atlanta, Georgia, Professor Henry Kraemer, of the University of Michigan, G. A. Barbridge, of Nova Scotia, Samuel W. Fairchild and Professor Virgil A. Coblentz, of New York.

A communication from George M. Beringer, chairman of the board of trustees, who was unable to be present, was then read by the Secretary.

The memorial resolutions adopted by the Pennsylvania Pharmaceutical Association were then read by the Secretary.

The resolutions and minutes of appreciation as prepared by the committee appointed by the college were then read by the chairman, Joseph W. England.

After the conclusion of the reading Professor E. G. Eberle moved that we acknowledge this memorial as the sentiment of this meeting, and that it be adopted by a rising vote, which was unanimously carried. Resolutions adopted by the Faculty of the College, and by the Philadelphia Branch of the American Pharmaceutical Association were next read.

President French then called on a number of gentlemen present to give expression to their appreciation of and esteem for Professor Remington. Professor Samuel P. Sadtler, an associate of Professor Remington for many years, was the first speaker. Professor Sadtler's remarks were a loving tribute, as were the many others, who followed. President French followed with his appreciation of the character of Professor Remington and his services in behalf of the college. Professor J. W. Sturmer, associate dean; Dr. H. W. Wiley, president of the U. S. Pharmacopœial Convention; Mr. Samuel L. Hilton, treasures of the Convention; Dr. H. C. Wood, vice-chairman Committee of Revision of the Pharmacopœia; J. A. Koch, professor of pharmacy, Pittsburgh College of Pharmacy; Joseph L. Lemberger, vice-president Philadelphia College of Pharmacy; Harry Vin Arny, professor of chemistry, New York College of Pharmacy; Caswell A. Mayo, editor *American Druggist;* E. G. Eberle, editor *Journal of the American Pharmaceutical Association;* Charles H. LaWall, associate professor of pharmacy, Philadelphia College of Pharmacy; C. B. Lowe, professor of materia medica, Philadelphia College of Pharmacy; E. Fullerton Cook, associate director of pharmaceutical laboratory, Philadelphia College of

Pharmacy; F. X. Moerk, professor of analytical chemistry, Philadelphia College of Pharmacy; Dr. F. E. Stewart and Dr. P. S. Stout, were among those who feelingly expressed the loss to pharmacy and their personal appreciation of the services of this great teacher of pharmists.

Before adjournment a number of telegrams from prominent pharmacists throughout the United States and Canada were read.

C. A. Weidemann, M.D.,
Recording Secretary.

CORRESPONDENCE.

TREASURY DEPARTMENT,
UNITED STATES PUBLIC HEALTH SERVICE,
OFFICE OF HYGIENIC LABORATORY.
WASHINGTON.
January 11, 1918.

THE EDITOR, AMERICAN JOURNAL OF PHARMACY,
Philadelphia, Pa.

Dear Sir: Of late, the hygienic laboratory has received a number of inquiries, the purpose of which was to determine whether or not work on the compilation of "Digest of Comments on the United States Pharmacopœia and National Formulary" was being continued. In order that all of those who are interested may be correctly informed in regard to this matter, the accompanying notice has been drawn up. The publication of the same in your journal at an early date would be appreciated.

Thanking you in advance for the courtesy, I am

Sincerely yours,
G. W. McCoy,
Director.

COMPILATION OF DIGEST OF COMMENTS ON THE U. S. P. AND N. F. CONTINUED.

The work of compiling the series of hygienic laboratory bulletins entitled "Digest of Comments on the Pharmacopœia of the United States of America and on the National Formulary," which was interrupted by the illness and death of technical assistant, Martin I. Wilbert, has been resumed by A. G. DuMez, who was appointed to succeed the former June 1, 1917. The Digest of Comments for the calendar year ending December 31, 1915, has been completed and is ready for publication, and considerable progress has been made in the preparation of the abstracts for the 1916 bulletin.

DEPARTMENT OF AGRICULTURE,
BUREAU OF CHEMISTRY,
WASHINGTON, D. C.,
January 11, 1918.

DR. GEORGE M. BERINGER, EDITOR,
AMERICAN JOURNAL OF PHARMACY,
145 North Tenth Street,
Philadelphia, Pa.

Dear Doctor Beringer: My attention has just been called to the November, 1917, issue of the AMERICAN JOURNAL OF PHARMACY, in which you have reprinted a number of the Service and Regulatory Announcements of this Bureau of interest to the drug trade. I am pleased to note that you have published them in your journal and thus assisted in the dissemination of the information contained in them.

I would like, however, to call your attention to an error which appeared in the Service and Regulatory Announcement regarding the method for the determination of volatile oil in mustard seed. The copy supplied by this Bureau to the printer, and also the galley proof returned, were correct, but for some unexplainable reason the proof was changed again in the printing office. In the last sentence the word *"gram"* should be substituted for "grain." The revised sentence would then read: "Each mil of 0.1 N silver nitrate consumed equals 0.004956 gram of allylisothiocyanate." I would appreciate it if you would make this correction in an early issue of your journal.

Very truly yours,
C. L. ALSBERG,
Chief.

The attention of the subscribers and readers of the AMERICAN JOURNAL OF PHARMACY is directed to this error with the request that they promptly note and correct same on the printed page.

EDITOR.

BOOK REVIEWS.

THE PRACTICE OF PHARMACY: A TREATISE ON THE MODES OF MAKING AND DISPENSING OFFICIAL, UNOFFICIAL, AND EXTEMPORANEOUS PREPARATIONS, WITH DESCRIPTIONS OF MEDICINAL SUBSTANCES, THEIR PROPERTIES, USES, AND DOSES. A Handbook for Pharmacists and Physicians and a Text-book for Students. Sixth Edition. By Joseph P. Remington, Ph.M., Phar.D., F.C.S., assisted by E. Fullerton Cook, P.D. With over Eight Hundred Illustrations. Publishers, J. B. Lippincott Company, Philadelphia and London. Vols. I and II, Regular Cloth Binding, each $4.50 net One Volume complete, bound in Buckram, $8.00 net.

The sixth edition of this master work on pharmacy in the English language was necessitated by the publication of the Ninth Revision of the United States Pharmacopœia and the Fourth Edition of the National Formulary. All of the important statements in these two national legal standards for drugs have been incorporated in the volume now before us. The attempt to produce a work on pharmacy that would be up to date and comprehensive in evidenced throughout its pages. The preëminent ability and long experience as a teacher enabled the author to present in his characteristic clear and logical style the subject-matter in an interesting and inviting manner in this instructive book.

In this edition, the arrangement follows closely that of the previous editions. The "Introductory" in rather terse language presents pharmaceutical terms, definitions and explanations of the authority of pharmacopœias, formularies and the several commentaries on these; but the very clarity of the statements invites the careful perusal of the student. Metrology rightly receives early and a clear exposition in the pages of the book. This knowledge so essential to the practice of either medicine or pharmacy and which, too frequently, has proven a perplexing stumbling block to the student, is here so presented that the student who masters this chapter cannot fail to have a clear conception and understanding of the subject.

The tabulations of the various classes of galenicals and of the drug and chemical products is a feature that has been very generally adopted by teachers of pharmacy since the early works of Procter and Parrish and is extensively used in this edition. These bird-eye views of subjects as shown in very many of the chapters will prove a great aid to the student by presenting a comprehensive scheme for facilitating the acquiring of the knowledge. The questions following each chapter will likewise prove beneficial by enabling him to determine at once what part of the content of the chapter he has failed to acquire.

The book is exceptionally free from typographical errors and a critical examination reveals but very few statements of facts to which one can take exception. There are, however, a few "slips" to which attention should be called. For example on page 1,051, Spiritus Frumenti is designated as "U. S.," although the author was well aware that whisky had been deleted from the pharmacopœia. In this connection we likewise note that the tests of the U. S. P. VIII are given despite the fact that their reliability was questioned and improvements published.

The author was such an expert in explaining to his classes the various processes of percolation that we are disappointed in noting the scant consideration that is given to the process of "Fractional Percolation" as proposed by the late Professor C. Lewis Diehl and the modification of this excellent process adopted in the U. S. P. IX and to the differentiation between this and "Repercolation." Oldberg is, likewise, given credit for a style of percolator which was described much earlier by Diehl.

On page 1251, in discussing Sapo Mollis U. S. P. IX, the author states: "The new soap is light yelow in color and the usual synonym 'Green Soap' cannot, therefore, be properly applied." Nevertheless in the same article on the same page we are told under "Uses: *Green soap* is used in skin diseases."

Although the author repeats in his work the "Type Processes" for Fluidextracts and Tinctures as adopted by the U. S. P. IX in order to save useless repetition and waste of space, he prints in each formula full directions, following the style of the U. S. P. VIII. The reason for this is not apparent, unless it was deemed desirable to do so because of the plan adopted throughout the entire volume of giving in each formula alternative quantities, the official formulas being designated as "Metric" and the transpositions in Apothecaries' Weight and Measure as "Old Form."

Any one who has attempted to classify drugs in accordance with their constituents will recognize the peculiar difficulties and problems that arise. The attempt to include in this work all of the drugs of the U. S. P. and N. F., and under such classifications, as could be expected has led to some incongruities.

The illustrations are numerous and usually quite appropriate. We would not, however, recommend the adoption of the apparatus as figured on page 220 (Fig. 265) for the manufacture of chlorine water. Many of the figures of apparatus show machinery suited for the manufacturer as well as the small types of machines suitable for the purposes of the retail dealer and this is a commendable feature of the book.

The sixth edition of this standard work not only maintains the standing and reputation of the preceding editions but excels these in comprehensive up-to-date treatment of the theories and practices of pharmacy. It should serve not only as the leading textbook for the student but should be a book of continuous use and daily reference in every pharmacy.

G. M. B.

American Pocket Medical Dictionary, edited by W. A. Newman Dorland, A.M., M.D. Tenth Edition, Revised, Philadelphia and London: W. B. Saunders Co., 1917.

This useful adjunct to the physician is too well known to require detailed description as to its advantages and uses. It consists of a pocket-sized book, substantially bound in a flexible cover, and contains 671 pages of definitions and tables, all of which are intended to have particular relevance and value in connection with the practice of medicine and surgery. There is much to commend and but little to criticize.

The only criticism that is at all applicable is that although it has been revised up to September, 1917, a number of important terms are not defined. For instance, the word "Wassermann" does not appear in the alphabetical list, but the reaction is described under the list of reactions, not being cross-indexed under the name of its author, as is done in other cases.

Although the war terms seem to have been well covered, no reference is made to gas gangrene, nor to Carrel-Dakin solution, although the Dakin solution is rather incompletely and unsatisfactorily defined as a solution containing washing soda, chlorinated lime and boric acid, used in irrigating wounds.

The most serious omission is in not cross-indexing a number of important remedial agents under their chemical names or the names under which they are officially known in the U. S. Pharmacopœia.

Among these may be mentioned acetyl salicylic acid, ethyl morphine, beta eucaine, bismuth betanaphtholate and diacetyl morphine.

These oversights will doubtless be corrected in the next printing and need not seriously detract from the everyday value of a book which should be owned not only by every physician but by every pharmacist and chemist as well.

CHARLES H. LAWALL.

THE CHEMIST AND DRUGGIST DIARY FOR 1918. 50th Year of Publication.

This is a handy desk companion giving in its necessarily restricted space authentic information on many subjects of present interest to the drug trade. The contents are classified under appropriate headings and with the index makes ready reference possible.

The Trade Directory is an alphabetical list of business houses dealing in drugs, chemicals, pharmaceuticals, sundries and allied products and gives for each firm the address, telephone number and cable address (if any) and a list of the principal products marketed.

The Buyer's Guide is a classified list of articles with the names of the producers appearing in the Trade Directory.

The Chemist's Calendar consists of short, descriptive chapters of the popular ideas of the characters of the month and of the medicines that may be needed with a selection of formulas for these. The formulas take a very wide range from cosmetics to "blood purifiers," from chilblain paint to emulsions of cod-liver oil.

This is followed by pages containing a diary with titles of the months and days in Latin, and the English in brackets, with a space for daily notations, and the reader is advised to "Cultivate the diary habit and save yourself much mental worry."

Not the least important part of this desk book are the pages devoted to Military Hospitals Formulary, in which is found a selection of the formulas found useful in the present world war.

In short chapters are presented the important features of the British Income Tax and Stamp Duties, Schedules of Poisons, Cocaine and Opium Regulations and a table of comparative prices of the more important drugs and chemicals at various periods since the outbreak of hostilities in 1914, list of preparations withdrawn from the British Pharmacopœia because of the war, Postal Information, etc.

The 92 pages contain much that will be of daily service to the busy druggists of the British Isles. G. M. B.

ANNUAL REPORT OF THE SURGEON-GENERAL OF THE PUBLIC HEALTH SERVICE OF THE UNITED STATES FOR THE FISCAL YEAR OF 1917.

This report which is a book of 387 pages covers an extensive field of work, and attests to the efficiency of the Public Health Service presided over by Surgeon-General Blue.

It is impossible in a brief article to even mention by title the list of activities of this service, only a few can be mentioned.

Pellagra, which has prevailed extensively in parts of the South, is supposed to be caused by eating damaged maize. As studied in some asylums it has been found to be entirely preventable by proper diet. It has been possible to transmit the disease by inoculation.

Trachoma, a disease of the eyes leading to blindness, has been treated in two hospitals established in the Appalachian Mountains. As the disease was a formidable enemy in the Russo-Japanese War, it is recommended that the eyelids of all recruits be examined, especially in some parts of the South.

Health conditions surrounding employees, both women and men, have been closely studied. The mental and physical status of school children in various parts of the country have been studied, especially in New Castle and Sussex counties of Delaware, numbers of feeble-minded children thus being brought to light.

In the report of the hygienic laboratory, the death of Dr. Martin I. Wilbert is mentioned.

The Division of Pharmacology has examined wild-grown digitalis from Oregon and has been found that it complied with the requirements of the U. S. Pharmacopœia for strength. It is claimed as the result of considerable work done on cannabis that the methods adopted by the U. S. Pharmacopœia (9th edition) for testing this drug did not always yield satisfactory results.

In view of some unfavorable reports concerning the toxicity of salvarsan and analogous compounds, it is now under careful study.

The quarantine work carried on along the Mexican-Texas border is both extensive and important; they are constantly on the look out for typhus fever, the importance of it being shown by the fact that in the city of Zacatecas, Mex., in 4 months of 1917 there were 2,000 deaths from this disease in a population of 60,000.

Very complete equipments are maintained along this border for ridding the imigrants (Mexican laborers, etc.) of vermin.

For destroying headlice on men and boys, the hair is clipped, placed on newspapers and burned. In the case of women and girls the hair was treated with an equal mixture of kerosene and vinegar for half an hour, afterwards given a washing with warm water and soap.

In the fumigation of vessels and the destruction of rats, cyanide gas was far more efficient than sulphur dioxide. By compliance with the regulations established for cyanide fumigation 900 vessels have been so treated without an accident.

A large part of the book is taken up with reports from the quarantine stations maintained by the United States which prevent the entrance into our country of various diseases, many of them of a malignant character, thus safeguarding the health of every citizen.

Under the head of Domestic (Interstate) Quarantine an interesting account is given of the assistance given by the Public Health Service in the effort to control poliomyelitis (infantile paralysis) in different parts of the eastern United States.

C. B. Lowe, M.D.

NEWS ITEMS AND PERSONAL NOTICES.

The College Service Flag.—A service flag displayed at the Philadelphia College of Pharmacy shows that one hundred and fifty-three of the graduates of this college are already enlisted in the military service of the United States.

Professor Remington's Scientific Library.—This entire branch of his extensive private library was bequeathed to his two associates in the department of pharmacy at the college, Professors Charles H. Lawall and E. Fullerton Cook, to be divided equally between them. This contains many volumes of historic value as well as of scientific interest. For the present, this will be preserved intact in the pharmacy department as a reference library for the students engaged therein and will be catalogued by the librarian of the college as an adjunct library of the college.

The Lily Scientific Bulletin.—Number 8 of the first series of these contributions, published by Eli Lily & Company of Indianapolis, has just been received. The papers contained present several creditable pieces of research work carried on by the scientific division of the laboratories.

The Jacobs' Pharmacy Co., of Atlanta, Ga., announce that twenty-seven of their employees have answered the country's call and entered the governmental service. This shortage of competent help has compelled this company to reduce the hours of service in two of their principal stores.

The National Pharmaceutical Service Association, out of respect to the memory and services of Professor Remington, cancelled the January meeting. This Association is energetically carrying on the propaganda in favor of the Edmond's Bill now pending in Congress to provide a Pharmaceutical Corps in the United States Army. A committee of the prominent members will attend the hearing on this measure before the Committee on Military Affairs of the House of Representatives.

OBITUARY.

Charles T. George. Died at his home in Harrisburg on December 26, in the seventy-third year of his life. He was born in Homberg, Hesse, Germany, on February 2, 1845, and came to America when but six years of age. His education was acquired in the public schools of Harrisburg. He entered a drug store early in his youth, and, shortly after arriving at his majority, he engaged in the drug business on his own account. For years he was a prominent figure in the pharmaceutical circles in Pennsylvania. He was one of the charter members of the State Association organized in 1878 and was elected as the president of the Association in 1885.

He served as a member of the Board of Pharmacy of Pennsylvania and was secretary thereof for many years. He joined the American Pharmaceutical Association in 1873 and the Philadelphia College of Pharmacy in 1895, becoming a life member of this organization and an honorary member of the Alumni Association. He was for some time a school director in Harrisburg. He was likewise prominent in Masonic circles and in the Lutheran church.

Samuel L. Bines. Died at his residence in George's Hill, West Philadelphia, on December 20, 1917, at the ripe age of eighty-nine years. Mr. Bines graduated from the Philadelphia College of Pharmacy in 1848, and prior to his decease was the oldest living member of the Alumni Association.

Frederick L. Upjohn. Died at his home in Huntington, L. I., on December 1, 1917, and was sixty years old. He was the son of Dr. Uriah Upjohn. He received his early education and part of his pharmaceutical education in Michigan and attended the Philadelphia College of Pharmacy for one year. He became a member of the College in 1897. After completion of his college training, he managed the New York branch of the Upjohn Co. for upwards of twenty years.

THE AMERICAN
JOURNAL OF PHARMACY

MARCH, 1918

EDITORIAL.

THE DEBT OF AN ALUMNUS.

It is now generally conceded that our professional colleges and technical schools carry on their educational work at a cost that greatly exceeds any fees that it would be possible to charge their students. Comparatively few students seeking such education have unlimited means, and at this period of preparation for life's work, most of them are more or less dependent.

It is evident that the loss thus sustained by educational institutions in conducting their beneficent work, which is so essential to the vocations whose otherwise depleted ranks they are filling and, likewise, important as a factor contributing to our national progress, must somehow be provided for. Sooner or later, this problem becomes an imperative duty of the managers or trustees of each educational institution and some plan of sustenance has to be evolved suited to the peculiar needs and possibilities of the individual school.

In many states the professional colleges and technical schools are considered as proper objects for state aid and the legislatures apportion a percentage of the taxes collected toward the maintenance of these educational institutions. Such state aid is usually sufficient to at least compensate for the deficiency arising from the scant fees of students. Institutions of learning that are sustained either wholly or in part by state aid have the problem of financial management minimized.

With the development of the enormous resources of the United States and the phenomenal national prosperity ensuing therefrom there has coördinately developed a public-spirited benevolence among many of those who have been fortunate in accumulating an abundance of wealth and it is a happy coincidence, auguring well for the future of the nation, that in increasing numbers these have endowed educational institutions.

However, there still remain a number of schools that are struggling to maintain a high standard in their work and to develop their possibilities without enjoying either state aid or the advantage of adequate endowment. That this handicap will become an insurmountable barrier to future progress and that it must be removed needs no argument. Possibly the most unique example of a school that has struggled against this illogical situation for nearly a century, and nevertheless has been foremost among the educators of pharmacists and chemists, is the Philadelphia College of Pharmacy which throughout this long period has relied upon its students and members for support. This handicap must be removed if this pioneer of pharmaceutical education in America is to fulfill its proper sphere of greater usefulness to pharmacy and to the country. We are pleased to report that the problem of an Endowment Fund for this school is receiving the earnest consideration of the officials and we are confident that the effort will receive the support of every alumnus and the aid of many friends of specialized higher education.

The graduate as he successfully completes his studies and receives his diploma is too highly elated, too fully imbued with the emotions and sentiments of the hour, to give serious consideration to his obligations to his alma mater. In after years, the alumnus has frequent occasion and ample opportunity to give consideration to his indebtedness. The difference between what it cost the college to educate him and the fees that he paid is but a small portion of his just obligation.

What alumnus can estimate the value of his collegiate preceptorship, or the influence of the moral and mental discipline instilled into his career along with the technical knowledge imparted? What has been the influence of these precepts in determining his business or professional success? Many of those who have been preëminently successful in the various branches of pharmacy have gratefully attested their indebtedness to the training of their alma mater.

The alumnus should be true to the teachings and precepts of his alma mater, and at all times loyal to her interests. The person who forgets this obligation or who speaks disparagingly of the very agency that has educated him and enabled his success shows evidence of moral and mental perversion.

The true alumnus always sustains his alma mater and takes pride in her achievements. He appreciates that he has inherited a share in her work and glory and, likewise, that he has a share of the responsibility for her future success. There is no better way for him to discharge his responsibility, to repay his moral indebtedness or to demonstrate his gratitude than to take an active interest in her welfare, to conscientiously assist in her problems and to contribute to her needs. The tributes of service and of financial aid can, at least, be a part payment of the debt that a loyal alumnus appreciates is due to his alma mater.

G. M. B.

PRICE MAINTENANCE.

The time-honored adage that "competition is the life of trade" has been so indented by questionable trade practices that its lines must soon be corrected by some qualifying term that will restrict as beneficial only such methods of competition as are fair to the consumer and salutary to trade. It is rapidly becoming more and more in evidence that tradesmen and the various trade interests are awakening to the fact that unrestricted price-cutting is a great economic evil that has sapped the strength and life of many legitimate and deserving enterprises.

The drug trade, especially, has been the goat of price-cutting. The popular proprietary medicines and toilet articles, constituting an important part of the druggist's stock, have been the favorite "eye catchers" in the advertisements of the department stores and the "cut rate" shops. The practice of advertising commonly well-known goods as "catch pennies" for the purpose of profiteering in other lines is too well known to need any comment.

As a rule, price-cutting and cut-rate advertising can be successful only where the capital of the advertiser and the volume of his business permits of an equalization of the total profits to the general average that is essential to the safe conduct of the business. How many of the smaller merchants, especially druggists, have followed this ignis-fatuus to bankruptcy when the same amount of energy expended along established ethical methods would have gained the confidence of the public and meant success! The demoralizing effect of such failures on all business makes it a public question of some moment. Moreover, where is the supposed advantage to the consumer if, by these tricks of advertising, he is induced to pay twenty-five per cent. more for several articles because he has been offered one at half price?

The lawmakers of the nation and of a number of the states have been concerned with the framing and enactment of laws that would prevent combinations of capital in restraint of trade. The Sherman Act and the Clayton Act are the Federal Laws presumed to protect consumers from such combinations. We, likewise, have laws against unfair methods in business and the courts have frequently been called upon to determine and restrain unfair practices. There is a growing sentiment throughout the country that unrestricted price-cutting should also be classified as an unfair method of business.

In the case of the Great Atlantic and Pacific Tea Company vs. Cream of Wheat Company, the presiding judge, Hough, went somewhat further and expressed his opinion that price-cutting really restrains trade and lessens competition and that the maintenance of fair retail prices is in the interest of the buying public. Once this principle becomes established in our law, then we will have a basis on which we can found legal enactments that will control the evils resulting from unrestricted price-cutting.

In recent years, the authority of the federal government has been exercised in many ways to correct trade evils. The Food and Drugs Act, aimed to punish adulteration and misbranding in the trade of these essentials, was quickly followed by a pure paint act and a disinfectant act and other laws to compel truthful statements on labels and honest dealings. The demand for laws against fraudulent methods of advertising is another step toward uprightness in merchandising and the campaign of education for honest dealing and fair trade need not be very greatly extended to cover the evil of unscrupulous price-cutting. The problem now seems to center around the difficulty of so wording an act that a proper control of price can be maintained by a manufacturer without opening the door to combinations of capital in restraint of trade as forbidden by existing laws. This cannot be considered as an insurmountable barrier and it is quite probable that with further study one or more of the acts aiming at the price-cutting evil that have been submitted to Congress may be so amended as to permit of proper price maintenance without injury to the consumers and with needed relief to the merchants who are advocating fair and honest dealing in all trade methods.

The authority of the national government and of the state governments has been so repeatedly exercised in the fixing of rates for public services that the authority for such action is now no longer questioned. Even more frequently have the officers of the government, by arbitration or otherwise, determined wages and standardized prices for commodities. The laborer is worthy of his hire and should receive an equitable recompense for his service and the tradesman deserves the same fair treatment and should be guaranteed his overhead expenses and a just return on his capital invested and compensation for service rendered. As an essential element of society, the merchant expects due consideration of his necessities for the successful carrying on of his part of the nation's work.

A number of schemes aiming at price protection in the interest of the merchant alone, have been attempted from time to time. Most of these were only too apparent subterfuges to circumvent and defeat the purpose of the Sherman Act, and consequently these failed to withstand testing in the courts. It is becoming more and more apparent that such artifices are not the proper weapons and that the merchants who are seeking relief from the evils of unscrupulous price-cutting and its associated unconscionable profiteering must secure this by Congressional enactment of another " fair trade law " that will make it possible to control retail price-fixing so as to be beneficial to the tradesmen and work no injury to the consumers.

The suit instituted by the Attorney-General of the United States against Colgate and Company alleging violations of the Sherman law raises some new contentions and it becomes a grave question if the Department of Justice is not endeavoring to extend the provisions of this act beyond the intent of Congress in its enactment.

This well-known firm market an extensive line of products consisting of perfumes, soaps and toilet articles. For many years they have published a price list and in this appears opposite to each item the *minimum price* which they ask their customers to observe in the retailing of such article and the company reserves the right to accept direct orders only from those who do not sell these products below the minimum prices named. It is not alleged that Colgate and Company coerce dealers or prevent them from securing supplies of Colgate's products or of other goods elsewhere or that there is any combination with any other person or firm to control prices on similar lines of products.

The minimum prices named in the price list are as a rule below the normal retail prices and so actually benefit the buying public while assuring to the dealer only a moderate profit which in some instances has been criticized as inadequate.

It would appear to us that there is here *no evidence of intent to restrain trade.* The effort of Colgate and Company appears to be to standardize, to stabilize prices in the interest of all concerned. The effect has been the very opposite of a restraint of trade. This plan has stimulated the interest of dealers and gained the confidence of the consumers and the actual result has doubtless been an increased consumption of the products of Colgate and Company. That such a plan, which is essentially a plan for "fair trade," working to the benefit of all the interests concerned, should be construed as a violation of any law enacted in the interest of fair trade appears to us as inconsistent and untenable.

G. M. B.

WAFER ASH BARK AS AN ADULTERANT FOR EUONYMUS.

By Heber W. Youngken, A.M., Ph.D.

Within the past few months the writer received four lots ot a bark purchased as and labelled "Wahoo Bark." Upon examination, one of these was found to be entirely wafer ash bark, while the other three contained varying proportions of wahoo (euonymus) and wafer ash. Just recently the writer has been apprised by a local wholesaler that something is wrong with his supply of euonymus. It is quite possible that the condition of euonymus on the market has been far from staple for some time. With this thought in mind and with the view toward aiding drug collectors and pharmacists in distinguishing between the genuine and spurious articles, the writer presents the important diagnostic characteristics of the plants and barks yielded by them.

Wafer ash bark is the bark of *Ptelea trifoliata* L., a small rutaceous tree attaining the height of from 20 to 25 feet with a straight trunk 6–12 inches in diameter, or a low-spreading shrub. It grows in rich moist soil from Lake Ontario to northern Florida and west to Minnesota and Colorado. Its branchlets bear alternate, rarely opposite trifoliate leaves, each of which consists of a fairly stout petiole 2½ to 3 inches long, bearing upon its extremly 3 subsessile, ovate to oblong, serrate leaflets. The terminal leaflet is generally larger than the other two. The greenish-white flowers appear from March to June in terminal compound cymes and possess a rather disagreeable odor. The fruits are orbicular samaras ⅔ to ¾ of an inch in diameter, the wing portion of each being membranous, reticulate and emarginate. They ripen in the southern latitude in early summer but not until late in autumn in the northern states and persist on the long slender pedicels until the following spring.

Euonymus N. F., sometimes called wahoo or burning bush, is the dried bark of the root of *Euonymus atropurpureus* Jacquin, a shrub growing to the height of 6 to 10 feet or rarely (frequently west of the Mississippi) a slender tree 20 to 25 feet high, with a trunk 6–7 inches in diameter and covered with ash-gray fluted bark. It is found growing in rich soil generally along the edge of woods from Ontario to northern Florida and west to Montana, Arkansas and the Indian Territory. The branchlets (twigs) are obtusely 4-angled and bear simple, opposite, elliptical to ovate, acuminate, serrulate and membranous leaves, 2 to 5 inches long and 1 to 2 inches broad. The dark purple flowers appear on 7- to 15-flowered cymes from May until the middle of June. The fruit is a 3 to 4 deeply lobed capsule from ½ to ⅔ inch in diameter with light purple valves, which ripens in October, dehisces to expose its seeds, and remains on the cyme during the early winter months. The seeds are characterized by being covered with a thin scarlet aril.

Gross Structure of Wafer Ash Bark.—This bark appears on the market in the form of irregular transversely curved pieces or in quills of variable size and 3 to 4 Mm. thick. Its outer surface is light brown with prominent broad irregular transverse, grayish-white lenticels and transverse ridges. Its inner surface is brownish-yellow and smooth. Its fracture is short, the broken surfaces appearing waxy and pale yellow. The odor is faint and the taste bitter and acrid.

Gross Structure of Euonymus (Wahoo) Bark.—It occurs in transversely curved pieces or single quills of variable size and 1 to 2.5 Mm. thick. Its outer surface is graying to grayish-brown, irregularly furrowed and ridged and showing occasional transverse lenticels. Its inner surface is light brown or light buff. Its fracture is short exhibiting silky projecting caoutchouc threads in the inner phloëm region. Its odor is characteristic and its taste, bitter and acrid.

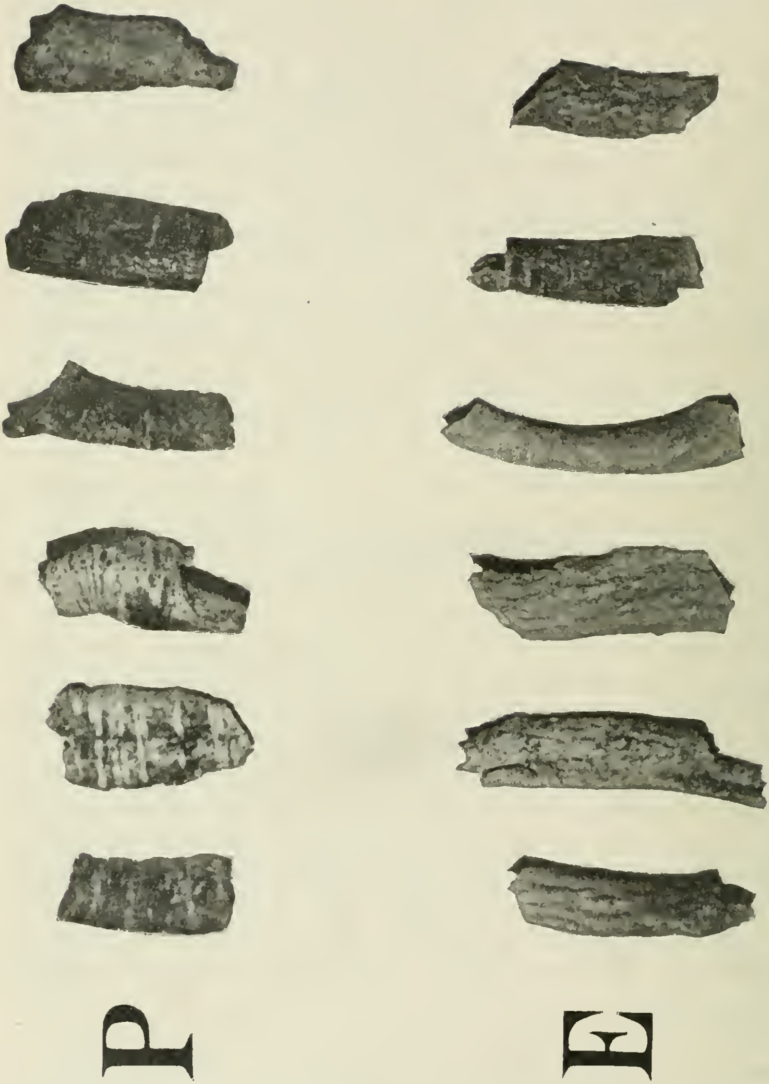

Fig. 1. *P*, Wafer ash bark; *E*, *Euonymus* N. F. (Photograph ¾ natural size.)

Histology of Wafer Ash Bark.—Under the microscope the following structural characteristics may be observed, passing from outer to inner surface:

1. Numerous layers of tangentially elongated cork cells, the walls of which are more or less lignified.

2. A cork cambium (phellogen) of delicate-walled cells, rich in protoplasm and exhibiting cross walls. Many of the cells of this region possess solitary rhombohedral crystals of calcium oxalate.

3. Several layers of stone cells forming a continuous sclerenchyme sheath.

4. A broad cortex zone consisting of tangentially elongated cortical parenchyme cells and intercellular-air-spaces. Some of the cortical parenchyme cells contain numerous spheroidal or ovate starch grains while others contain rosette aggregates of calcium oxalate. The starch grains are simple or 2 to 4 compound. Scattered about in the cortical and outer phloëm regions will be seen sclerenchyme elements either isolated or in small groups.

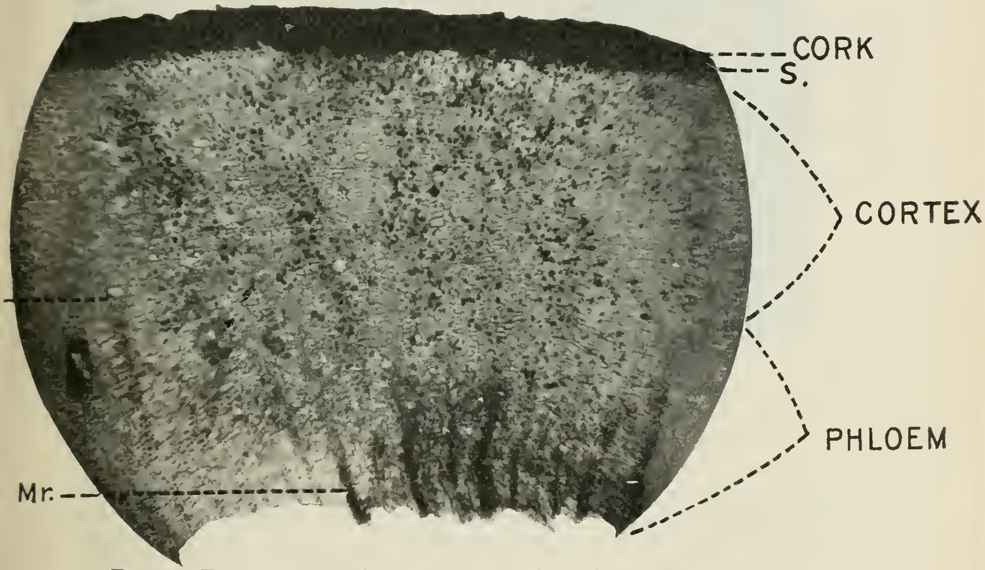

Fig. 2. Transverse section of wafer ash bark. *ss,* secretion sac; *mr,* medullary ray; *S,* region of stone cells and rhombohedral crystals shown enlarged in Fig. 3. (Microphotograph × 22.)

5. A broad phloëm consisting of numerous phloëm patches separated from each other by wavy medullary rays which are 1 to 5 cells wide as seen in tangential section. Secretion sacs containing oil are found scattered in both cortex and phloëm. Some of the intercellular-air-spaces show rows of calcium oxalate crystals.

Histology of Euonymus.—Under the microscope, passing from outer to inner surface, this bark presents the following peculiarities:

1. An irregular cork zone showing lenticels and many layers of tangentially elongated cork cells whose walls may be either suberized or slightly lignified.

2. A cork cambium of meristematic cells.

3. A narrow cortex of cortical parenchyme cells, some of which contain more or less spheroidal starch grains while others contain rosette aggregates of calcium oxalate.

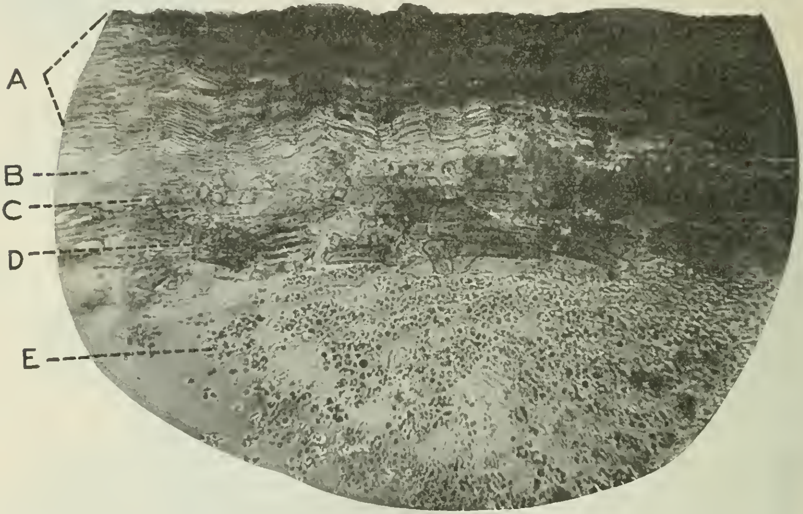

FIG. 3. Transverse section through outer portion of wafer ash bark (highly magnified). *A,* cork; *B,* cork cambium; *C,* solitary rhombohedral crystal of calcium oxalate; *D,* stone cells; *E,* cortical parenchyma containing small starch grains and rosette aggregates of calcium oxalate. (Photomicrograph × 200.)

4. A very broad phloëm, occupying most of the width of the section and consisting of cone-shaped phloëm masses (in cross section) traversed by wavy secondary medullar rays. Primary medullary rays separate the cone-shaped phloëm masses one from the other. These are one-cell wide in the inner phloëm but broaden out into fan-shaped wedges farther out. Some of the phloëm cells and medullary-ray cells contain starch grains while others possess rosette aggregates of calcium oxalate. Secretory cells containing a caoutchouc-like substance which dissolves in chloroform and carbon disulphide are found scattered about amidst other cells of the phloëm region.

After a close microscopical examination of a large number of transverse, radial-longitudinal and longitudinal-tangential sections of this bark, the writer has been unable to agree with the author of the N. F. IV description of the drug upon the presence of non-lignified bast fibers there mentioned. The "bast fibers" there indicated were probably wood fibers, present in the wood of the root, some of which frequently adheres to medicinal barks.

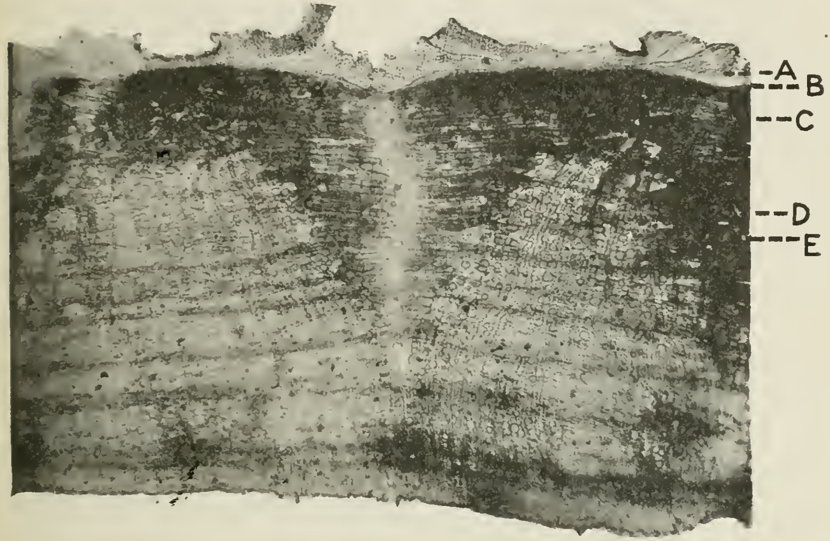

FIG. 4. Transverse section of *Euonymus* N. F. (wahoo bark). *A,* cork; *B,* cork cambium; *C,* cortex; *D,* portion of primary medullary ray; *E,* secondary medullary ray in phloëm patch. (Photomicrograph × 22.)

PHILADELPHIA COLLEGE OF PHARMACY,
PHARMACOGNOSY LABORATORY.

PLANT STRUCTURES AND CONNECTED PROBLEMS.

John Uri Lloyd, Phar.M., Cincinnati, Ohio.

The man who believes that plant remedial agents will ever become secondary in human or other life, is the man who, in the opinion of this writer, is either very one-sided in thought, or of small experience. Let us not underrate the value of all that comes through inventions due to human ingenuity, but let us not mistake. None of these inventions would have been possible but for vegetation—plant life. Let us fully credit whoever accomplishes in any direction where accomplishment has been made, whether in manipulative alterations or additions to life's opportunity, but let us not for one moment accept that man is independent of vegetation.

Listen! But for vegetation, neither man nor animal, of whatever kind, could ever have existed or had its being. From the germ of the spark of life to the fullest utilization of life's opportunities,—all, all comes from vegetation. No food that could for even a moderate length of time support a human being, could be made artificially by any method of man's ignenuity, without drawing from the great storehouse of nature, vegetation. Be it serum of the horse or juice of the turtle, be it vaccine of the cow or any product of animal economy, neither could be possible but for vegetation.

Listen! The muscle of the creature that is used as food, the fat of the creature that is used as food, the juice, the blood, the serums that are parts of food, are but materials transferred from vegetation to some new form, and when consumed as food by other animals, they become but another transformation in the life and substance that comes from the growing plant.

Not far distant is the flesh of the wild goose from the bacteria of the water that nourishes the vegetation that grows in the water, upon which the wild goose lives. The plankton jelly present in all water, and on which the small fish live, is not very far separated from the big fish that eats the small fish that has lived on the plankton, and when the human being enjoys the savory baked fish that lived on the small fish that lived on the plankton, he should credit this unseen plankton, that form of water vegetation, transparent as glass, ever-present in water, capable of being collected as a food by small fish and other water creatures.

Listen! Know you a beef or a sheep or an animal of any description, that could have been what it is but for the food it eats? Know you any creature that, either in the first or the last analysis, lives on aught but plant food? Destroy the grass of the field, and the fenced-in cattle die of starvation. Destroy the nuts and the buds and roots of the trees of the wood, and the squirrel no longer lives. He has starved to death. Destroy the creatures that live on the grass and the corn and the wheat and the rye, and the buds and the roots and the fruits of the trees and shrubs and plants, annuals and biennials, and humanity not only disappears, but it quickly disappears.

Destroy the plankton of the water in creek, river and lake, and the minnow dies. Destroy minnow life, and no big fish follows. Destroy thus the big fish from all the waters of the world, and human life in immense quantities will be sacrificed.

Then let those who propose to raise high the banner bespeaking man's independence of nature halt, and think as they might think. Let them credit the great I Am, under whatever name they worship, or whatever creed they believe it best for them to acknowledge, and give thanks to the great Creator of it all. Let one and all unite in accepting that the first step, the greatest gift that has been given to man or to any creature, whatever that creature may be, is the gift of vegetation.

Think not that such as this concerns not the pharmacist and the physician. As one who for many years has been delving in the helpless struggle to attempt to comprehend but a little of it all, as one who for more than half a century has been as

> "An infant crying in the night,"

I speak. As one who sums up the substance of the lessons that have come in the passing decades, may I not ask, Is not the man in medicine as dependent on vegetation as is the man who lives on vegetation? Are not the most valuable of all the remedies that in therapeutic service have accomplished from the days of the dawn of history, been either vegetable remedies or the products and educts of vegetation?

Give to Mother Earth the credit of so-called inorganics, on which, perhaps, a carping critic might say vegetation depends for its very existence. But let us ask, "Before these so-called inorganics take their part in life's economy, comes not the vital touch, that makes them a part of vegetation? Does a dead seed sprout, in the richest of soil? And in the life of the plant are not the assimilated earth structures each a part of the plant, no longer inorganic, but all organic?" So, may I not ask, does not even Mother Earth need the touch of the Great Creator, before whom all men must bow, before whom all that is, is comprehensible, though to the feebleness of the human mind, it remains recondite beyond expression?

Give to the waters of the ocean credit for the vapor that spreads the earth about, and, dropping from the clouds as rain, waters the earth, making possible the life of the growing plant. And yet, the vapor of the water of the ocean, that makes the rain, could not nourish the growing plant were the life spark absent, the vital touch that is not water and is not earth, but comes from out the gift of the great I Am.

Give to the sunbeam credit for all that comes in its ray of wealth. Mantling the earth, it liquefies ice and melts snow, penetrates the ground and inspires the growing bud of the seed, that, under its touch, springs into life and activity. It sucks from the water of the ocean the moisture necessary to the plant's creation and existence. Together, water, light and heat penetrate the earth where creeps the root, where lie the salts and minerals needed in the life of the coming plant. Grasping, in a manner incomprehensible to us, the invisible gases of the air and those locked in the water that nourishes the roots, they form the food needed by the growing plant.

Give credit to one and all of these, but after all this is done, do not fail to accept that behind it all, beyond it all, outside it all, immeasurably greater than it all, is the Creator of all, who makes possible all that lies in life's economy.

Let us now apply the foregoing to the thought in mind when began this dissertation. As a text, the writer had before him a sentence expressed by the talented Dr. Martin I. Fischer, than whom no man to the writer known, in pharmacological research concerning life tissues and structures, is more competent. He speaks by authority, from the scientific side of life. His thought chimes into that which came to this writer from decades of empirical struggles in the study of vegetable remedial agents. Close together do we find our final thought, as expressed by myself in the foregoing pages, and as voiced so beautifully by Dr. Fischer in a statement of fact presented in an address before the Cincinnati branch of the

American Pharmaceutical Association, October 17, 1916, from which we transcribe, as follows:

> "Among the most valued medicaments are to be included compounds and remedies established one hundred or more years ago. That it is a mistake to abandon tried and unquestioned remedies in favor of modern innovations that are experimental, and too often inadequate. Let me counsel the return to professional favor certain neglected pharmaceutical compounds of the fathers, that need but be known to the physicians of today, to be valued above others, less serviceable and more expensive. Such a return to past pharmaceutical preparations would not disturb modern research, but would give to legitimate apothecaries the much-needed professional encouragement of prescribing physicians."

SOME NEW AND INTERESTING VEGETABLE FOODS AND FRUITS.

CHARLES H. LAWALL, PH.M.

REPORT OF A LECTURE DELIVERED AT THE WAGNER FREE INSTITUTE OF SCIENCE JANUARY 14, 1918, BEFORE THE PHILADELPHIA NATURAL HISTORY SOCIETY.

At this particular time in the world's history every land is trying to save the old foods and to develop new ones. We have food conservation and food conversation. Both are needed. A broad-minded attitude and willingness to try new foods is a necessary factor in development along this line.

It is not intended in this lecture to discuss the numberless varieties of manufactured foods which are constantly appearing upon the market in new forms and under strange names. Some of these are simply old friends with new faces and deserve no mention. We want now to consider briefly the list of vegetable foods which are new within the past twenty-five years.

The word "new" in this connection does not necessarily imply that they have been created or developed within that time, although that is true in several cases. It means that through more perfect and rapid methods of transportation and distribution, certain foods which have had but a limited local use may be made available throughout a much larger area. No detailed consideration of new varieties of old fruits and vegetables finds a place. The number of these is legion and is being continually augmented, but they do not belong in this summary.

Neither is it the purpose to consider foods which might be classed as freaks or which can be eaten only by certain peoples, such as the edible birds' nests of the orientals. The foods herein described have either been observed or purchased in the Philadelphia or New York markets or sent out by the United States Department of Agriculture, Bureau of Plant Industry, in the hope that interest in them might be developed and their use encouraged.

Accounts of many of these are scattered individually through popular and scientific literature within the past ten years, but I have seen no comprehensive survey of the entire list at any time. Personal trials have been made of a number of them, such as the avocado, artichoke, celeriac, chayote, dasheen, Chinese cabbage, etc.

The most potent influence in the breaking down of the sharply defined seasons, which formerly ruled the market for perishable foods, is the modern refrigerator car, which, with the increased speed of railroad transportation, brings sections of the country within a few hours of each other which were formerly days apart. The result is that not only have seasonal variations in food largely disappeared, for in the larger cities fresh vegetables and fruits are now usually obtainable throughout the entire year, but new varieties and species are brought to markets to which they were formerly strange.

Some of these food novelties are luxuries, pure and simple, being high in price and low in calorific value. Others need only a popular demand to bring them into competition with many other low-priced staple foods of high food value. There is stretching out an ever-widening vista of agricultural possibilities, limited only by the flexibility of custom and freedom from prejudice shown by the food-consuming public. That prejudice plays an important part has been frequently evidenced in the past when attempts have been made to introduce new foods. Dr. Johnson is reported to have expressed his contempt for oats, now widely used as human food, by saying "It is a grain fed to horses in England and to people in Scotland." The development and popularity of the tomato has occurred within the last century and I have known individuals who remembered when this widely used fruit was believed to be poisonous, and the plant was used for ornamental purposes. The cranberry has come into general favor to the extent necessitating cultivation to supply the demand, within the memory of the present generation.

Two of our greatest staples, the potato and the maize, were unknown to the civilized world until after the discovery of America and then only in an imperfect and half wild form. The development of these to a point where they have become of enormous economic importance in many parts of the world makes us wonder at the possibilities for the future of some of our as yet undeveloped vegetable foods.

The names of many of the following foods cannot be found in present-day dictionaries or works of reference. They are examples of language in the making.

We shall begin with *alfalfa*. This is the Spanish name of the leguminous plant *Medicago sativa,* also known as lucerne; Spanish trefoil; French, Brazilian or Chilean clover; medic or purple medic. It has been largely grown as a forage crop and soil improver and has been suggested in the finely ground form, called alfalfa flour, for human food. Its high and complex protein content, together with the amount of mineral constituents and of crude fiber, make it available when mixed with wheat flour, for the preparation of griddle cakes, cake and even bread. The State College of Kansas has issued a bulletin upon the subject and articles have appeared in the *Forecast Magazine* for March, 1915, and the *National Food Magazine* for November, 1917. Alfalfa flour has also appeared upon the market in package form with recipes for its use.

As a factor in releasing wheat flour for export it may come to play an important part before the war is over, as the cost is low and the nutritive value high, although the high amount of crude fiber might make it irritating to some. The composition of alfalfa flour is as follows:

	Per Cent.
Fat	3.77
Protein	16.30
Carbohydrate	36.07
Crude Fiber	25.01
Ash	8.79

Alfalfa in the herb form has also been recommended for preparing an infusion to take the place of tea as a table beverage.

Artichoke.—Under this name two different foods are found in our market. One is the flower head of *Cynara Scolymus,* a plant of the aster family, which bears numerous fleshy, imbricated scales, which, with the large receptacle, constitute the edible portion of the plant. They have been known and used in Europe for centuries but have only recently appeared in American markets. They are usually cooked by steaming and are served with a white, thick sauce of the Bearnaise type. The cost is high and the nutritive value low and they are classed among the luxuries. The composition is as follows: Water, 79.5 per cent.; protein, 2.6 per cent.; fat, 0.2 per cent.; carbohydrate, 16.7 per cent. (inulin); crude fiber, 0.8 per cent.; ash, 1.0 per cent.

The other artichoke, more commonly known as the Jerusalem artichoke, is the tuberous root of *Helianthus tuberosus,* a variety of sunflower. It is a native of America and was cultivated and used as a food by the aborigines. The name "Jerusalem" is not a geographical descriptive name, as might be supposed, but, curiously enough, is a corruption of the Italian "girasole," meaning "turning toward the sun" (sunflower). It is prepared by boiling or baking, as are potatoes, and is frequently seen in our markets in the fall. The composition is: Water, 79.7 per cent.; protein, 2.4 per cent.; fat, 0.2 per cent.; carbohydrate (inulin), 16.1 per cent.; crude fiber, 1.1 per cent.; ash, 1.0 per cent.

Avocado.—This is the fruit of *Persea Persea* (*Persea gratissima*), commonly known as the alligator pear. It is a tropical fruit, commonly found in northern markets, where it brings a high price. It sometimes reaches a weight of several pounds. Its high fat content gives to it, in the countries where it is grown, the names of "vegetable marrow" and "midshipman's butter." The composition of the edible portion, according to the U. S. Dept. of Agriculture, is as follows: Water, 81.1 per cent.; protein, 1.0 per cent.; fat, 10.2 per cent.; sugar, 6.8 per cent.; ash, 0.9 per cent. The high fat content gives it a fuel value of 512 calories to the pound. It is sometimes eaten as a melon, but is more frequently used in salads. The flesh of the ripe fruit is about the consistency of well-made butter.

Cabbage, Chinese.—Also known as Pe Tsai, Shantung cabbage and celery cabbage, *Brassica chinensis.* This novel variant of the cabbage family, of which there are more than seventy kinds, does not form a head like the common cabbage, but the leaves form tall celery-like stalks, more than a foot in length, blanched at the lower portion. It is frequently found in the Philadelphia markets and may be used raw, as a salad like lettuce, or cooked like ordinary cabbage. The large white midrib may also be cooked like asparagus. (See U. S. Dept. of Agriculture Bulletin No. 68.) The composition is: Water, 96.50 per cent.; protein, 0.78 per cent.; fat, 0.10 per cent.; carbohydrate, 0.77 per cent.; crude fiber, 4.60 per cent.; ash, 0.65 per cent.

The Savoy cabbage, *Brassica bullata,* a variety of cabbage with crinkly, blistered looking leaves, is a very hardy type of cabbage often seen in the market stalls. The composition of this is about the same as ordinary cabbage.

Another cabbage-like vegetable of unidentifiable origin is sold in Chinese groceries, and consists of a cluster of stalks, white and succulent at the bottom and green and leafy at the top, and bears a raceme of yellow cruciferous flowers.

Cactus.—The edible fruit of many species of *Opuntia* have appeared in the market, usually under the name of Tuna Prickly Pear or Indian Fig. The strawberry pear, melon thistle and Mexican strawberry are fruits of other species of the cactus family, not so well known as the prickly pear. Prickly pears are found in various colors, as red, yellow and purple. They are pear-shaped or round and vary in weight from about an ounce to nearly a pound. The skin is usually tufted in spots with the spines which give the fruit its name. It is eaten raw, plain or in salads, in the form of preserves or sometimes pickled. A syrup made from the pulp is known as Tuna honey. The composition of the prickly pear is as follows: Water, 79.2 per cent.; protein, 1.4 per cent.; fat, 1.3 per cent.; sugars, 11.7 per cent.; crude fiber, 3.7 per cent.; ash, 2.7 per cent.

The fleshy leaves of the spineless variety of cactus, originated by Luther Burbank, is also of possible importance as a foodstuff. It can be grown without irrigation and the tremendous yield of 100 to 300 tons to the acre is sometimes obtained. It has been used successfully in feeding hogs and cattle, which are reported to thrive upon it. Its use as a human food is in its infancy. At a banquet in one of the western cities a few years ago, it was utilized in nine different ways.

Cardoon.—A plant of the thistle family, *Cynara cardunculus,* which, when full grown, attains a height of 8 or 10 feet. The young leaves and stalks, when banked with earth, like celery, become fleshy, crisp and tender. It is used in salads, soups and stews. It is quite popular in France, from whence it was formerly imported, although it is grown to some extent here. In Europe, the root, which is thick and fleshy and fine flavored, is used as a winter vegetable.

Celeriac.—Turnip-rooted Celery. The plant *Apium graveolens* var. *rapaceum,* is used both for its leafstalks, like celery, and its large roots, which are cooked and eaten like turnips or sliced raw and used in salads. This vegetable is frequently seen in Philadelphia markets during the fall and winter months. The composition of celeriac, according to the U. S. Dept. of Agriculture, is as follows: Water, 84.1 per cent.; protein, 1.5 per cent.; fat, 0.4 per cent.; carbohydrates, 13.2 per cent.; ash, 0.8 per cent. The fuel value is 285 calories per pound.

Chayote.—This vegetable, which is being introduced into northern markets by the U. S. Bureau of Plant Industry, a bulletin being issued on it, is the fruit of a cucurbitaceous plant, *Chayota edulis.* The fruit is pear-shaped, conspicuously furrowed, weighing from 4 to 8 ounces. It is somewhat prickly when fresh; the outer surface is green and shining, the inner portion white, and about of the consistency and insipidity of squash. It is called vegetable-pear in the British colonies. It is prepared by cooking like squash, and may be fried, creamed, stewed or made into salad or fritters. It is of low nutritive value and considerably higher in price than squash, with no advantage over the latter.

Chard.—The leafy tops of a variety of the common sugar beet (*Beta vulgaris*), grown only for its leaves and stalks. The leaves are prepared as greens, as the leaf midribs may be cooked and served like asparagus stalks. Swiss chard is the name applied to a variety with especially large leaves and midribs. The term chard is also applied to the blanched stalks of the artichoke, cardoon and several other plants. The composition is as follows: Water, 89.5 per cent.; protein, 2.2 per cent.; fat, 3.4 per cent.; carbohydrates, 3.2 per cent.; ash, 1.7 per cent.

Chicory.—The fresh root of "Succory" or chicory, *Cichorium Intybus,* is used as a vegetable, particularly by the Italians in our country and is sold in large quantities in New York City. It contains about 4 per cent. sugar, with little protein and fat. No starch is present, but instead there is found the carbohydrate principle inulin, which takes the place of starch in members of the composite family and which presumably possesses similar food value. The price of 10 cents a pound, at which fresh chicory root is sold, places it in the class of luxuries, for it possesses little fuel value. Its bitter taste makes it unpalatable to those who have not cultivated a liking for it.

Corn Flour, Maize Flour.—As a wheat sparer, one of the most valuable substances that has appeared recently upon the market, is finely ground flour made from maize or Indian corn. It has the following composition: Moisture, 7.9 per cent.; ash, 0.8 per cent.; fat, 4.85 per cent.; crude fiber, 0.45 per cent.; carbohydrates as starch, 77.6 per cent.; protein, 8.4 per cent.; foreign starches, none. It may be mixed with wheat flour to the extent of from 15 per cent. to 25 per cent., and bread, cakes and pies baked with this mixture are indistinguishable in taste and texture from those baked with wheat flour alone.

Cottonseed Flour.—Cottonseed oil (from *Gossypium herbaceum*) has been used as a food, either alone or in combination with other fats and oils, as in the compound and imitation lards. The press cake from the manufacture of the oil is a valuable foodstuff which has largely been used in cattle and stock feeding. It is recently being introduced as human food in package form, to be mixed with wheat flour in making bread, cakes, etc. The flour ground from whole cottonseed is also being introduced for the same purpose. It is very richer than the press cake and must be considerably diluted with wheat flour in baking and the shortening also omitted. Its composition is as follows: Water, 10 per cent.; protein, 19 per cent.; fat, 20 per cent.; carbohydrates, 24 per cent.; crude fiber, 22 per cent.; ash, 5 per cent. Its mineral and crude fiber content are also very high and are added reasons for its dilution with other flours in using. It is a low-priced, highly nutritious food, whose only disadvantage is the slightly disagreeable taste.

Dasheen.—This newly introduced tuber, in which the U. S. Bureau of Plant Industry (Bulletin 1110 and Yearbook of the U. S. Dept. of Agriculture, 1916) has taken such an interest, has been traced back originally to China, where it forms an important part of the staple food crop. It is the tuberous root of an aroid plant of the genus *Colocasia*. It has been cultivated for many years in tropical America and is known under the names "malanga," "eddo," "coco," "taya" and "taniei" (also spelled "tannia" and "tanyah"). It is closely allied to the Hawaiian Taro.

The plant looks like the caladium or elephant's ear. The corms or central tubers range in size from 1 to 5 pounds, and the smaller tubers which surround the corms in growing, weigh from 1 to 4 ounces. The yield from a single hill sometimes reaches 20 pounds.

It is beginning to be raised as a regular crop in many parts of the south and has been on sale in the northern markets for more than a year at a price not excessive, considering the high food value. Like other members of the arum family the tubers are very acrid in the fresh state and should not be tasted or eaten raw.

The food value is about 50 per cent. greater than that of the potato and the dasheen can be prepared and used in every way in which potatoes are used. It is mealy in texture and somewhat nutty in flavor. The U. S. Bureau of Plant Industry has issued several small leaflets giving recipes for methods of preparing this new and interesting food. Its subsequent development depends, of course, upon the popular demand. If this is created, the dasheen can doubtless be grown to market at about the same price as potatoes. Considering that it is a well-known staple in the West Indies, particularly in Trinidad and in some oriental countries, and that its nearest botanical relation in the vegetable foods, the taro, is the principal food of millions of natives of tropical and subtropical countries, the possibilities of the dasheen are very great. It sells at from 12 to 15 cents a pound in some of the larger groceries and in the Chinese quarter.

Egg Plant.—The fruit of *Solanum Melongena,* of which the purple, large-sized variety is best known, is also found in a smaller white or yellow variety about the size and shape of an egg, from whence probably the name originated. The names "brinjal" and "aubergine" are also applied to this fruit.

Fats and Oils.—Of the fats and oils, corn or maize oil, expressed from the germ of the maize kernel, and a by-product in the manufacture of corn products, is probably the most recent and is coming to be widely used in cooking for either deep fat frying or shortening.

The hydrogenated fats, those in which liquid vegetable oils are converted into solid fats by the use of nascent hydrogen in the presence of a catalytic agent, such as nickel, are also coming to be widely used. The oldest and best known of these is Crisco, which is a coined and trade-marked name.

A number of butter substitutes have recently appeared, in which cocoanut oil is the predominant fat instead of the mixture of beef and hog fats used as the basis of the older types of oleomargarine.

Feijoa.—Under this name has appeared in the Western markets a fruit, also known as the pineapple guava, which is described as possessing the refreshing taste of the pineapple, the richness of the avocado, the pungency of the strawberry guava with a tang of sassafras. The fruit is green in color, oval in shape and about 2½ inches in length.

Figs.—The "Eleme" or layer figs are packed in the American form known as "pulled" figs or in the square, plumped-up form known as "Loucoum" figs. These are both well known and have been on the market for many years. The only comment that need be made concerning them is to condemn the practice followed by California fig packers, of sulphuring the figs to keep them light colored and enable them to be packed in a much more moist condition. For this reason the imported figs are much to be preferred when flavor and not appearance alone is the criterion of value.

There have appeared on the market in the larger cities, at certain seasons, fresh figs; also there is sold a form of loose, sun-dried figs, which are intended to be cooked as are most other sun-dried fruits. Figs possess a high nutritive value on account of their high sugar content. The fuel value is about 1,500 calories to the pound and the composition is as follows: Water, 18.8 per cent.; protein, 4.3 per cent.; fat, 0.3 per cent.; sugars, 68 per cent.; crude fiber, 6.2 per cent.; ash, 2.4 per cent.

Kale.—This cabbage-like vegetable, *Brassica oleracea,* is also known as borecole and winter greens. It does not form heads, but grows in open-leaved style and is cooked as "greens" like spinach. There are many varieties, differing in leaf texture, some plain, others wavy or curved and variously veined. It varies in color also, from green, through red and brown to purple. The composition is: Water, 82.9 per cent.; protein, 3.8 per cent.; fat, 0.9 per cent.; carbohydrates, 9.9 per cent.; crude fiber, 1.5 per cent.; ash, 0.65 per cent.

Kohl Rabi.—This is another of the many species of the cabbage family and is derived from *Brassica Caulo-rapa.* It is also known as turnip cabbage or cabbage turnip. The leaves are sometimes used as greens, but the fleshy portion, which is really a thickened stem and grows above the ground instead of in it like the turnip, is the real food part and is cooked and served like the turnip. The analysis, according to the U. S. Dept. of Agriculture, is as follows: Water, 91.1 per cent.; protein, 2.0 per cent.; fat, 0.1 per cent.; carbohydrates, 5.5 per cent.; ash, 1.3 per cent. It is a vegetable of rather low food value, yielding only 140 calories to the pound.

Kumquat.—This is a fruit of the citrus family (*Citrus Japonica*), frequently seen in fruit stores. It is a dwarf orange, slightly smaller than a plum and of an elongated oval shape. It is eaten whole, skin and pulp, and is of an agreeably acid and aromatic taste. It is a native of China, but is now grown in many other countries. It is sometives served quartered or sliced in fruit and nut salads and is also made into marmalade and preserves. At state dinners in China the dwarfed individual trees are placed before the guests in order that they may pluck the fruit from the branches for themselves.

Lichi (*or Litchi*) *Nuts.*—This is a fruit (*Nephelium litchi*) grown in China and sold in a dried state in our country, usually in the Chinese quarters of our great cities. It is nearly round and a little over one inch across at its widest diameter, with a thin, papery, but tough shell, dark brown and reticulate externally, enclosing a dry, reddish-brown pulp, tasting somewhat like a raisin and containing a flat, stone-like seed. The composition of the edible portion, according to Atwater, is as follows: Water, 17.9 per cent.; protein, 2.9 per cent.; fat, 0.2 per cent.; sugar, 77.5 per cent.; ash, 1.2 per cent. The shell constitutes nearly one half of the weight of the nut as found in commerce. They are usually eaten as sold, but the Chinese infuse them with their tea, to which they communicate a characteristic flavor.

Loganberry.—This is a California product now grown in many parts of the East. It is a cross of the blackberry or dewberry and the raspberry, and is one of a number of such hybrids bearing such names as Lowberry, Laxtonberry, Phenomenal Berry, etc. The composition of the loganberry, according to a California Experiment Station Report (1895), is as follows: Water, 79.26 per cent.; citric acid, 1.52 per cent.; sugar (invert), 7.15 per cent.; protein, 4.55 per cent.; fat, 0.61 per cent.; crude fiber, 1.38 per cent.; ash, 0.57 per cent.

It is used in the fresh state and in the form of preserves and the expressed, unfermented and sterilized juice is coming to be widely sold as a substitute for grape juice as a beverage.

Loquat.—This is a yellow, oval, plum-like fruit of a Japanese tree, *Eriobotrya Japonica,* found frequently in American markets. It is also called "buroa," "lukwate," "pipa" and "Japanese medlar" or "Japan Plum." Its composition, according to the U. S. Dept. of Agriculture, is as follows: Water, 77.9 per cent.; protein, 0.2 per cent.; sugar, 20.2 per cent.; crude fiber, 0.6 per cent.; ash, 1.1 per cent. There are 395 calories in one pound of loquats. They can be eaten in almost any manner, either raw or cooked. When eaten raw, the peach-like down should be removed.

Mango.—The fruit of *Mangifera Indica,* a native of Asia, extensively cultivated and much esteemed in tropical climates and known in hundreds of varieties. It is frequently seen in northern markets in fancy fruit stores. The fruit is of various shapes and colors and the size ranges from that of a plum up to several pounds in weight. The pulp has an agreeable acidity and an aromatic flavor. It is eaten raw, like a melon, or cooked in preserves, pies, tarts, etc. Its great juiciness makes it a difficult fruit to eat gracefully unless previously sliced or prepared. The pulp of the mango constitutes the basis of most of the various forms of chutney, particularly those of the East Indian type. The composition of the pulp, according to the U. S. Dept. of Agriculture, is as follows: Water, 87.4 per cent.; protein, 0.6 per cent.; fat, 0.4 per cent.; sugar, 9.9 per cent.; crude fiber, 1.2 per cent.; ash, 0.6 per cent. The calorific value is comparatively low, being only 220 calories to the pound. This fruit must not be confused with the mango pepper used as a condiment and for pickling.

Melons.—Quite a number of new varieties of melons, cucurbitaceous fruits, have found their way into our eastern markets during recent years. Melons have been cultivated in the Orient for several thousands of years and it is not surprising that new forms should begin to appear in the west. Among the more prominent of those which have been noted are the following: Casaba, Honey Dew, Californian, Candian, Egyptian (golden), French and Spanish.

Olive.—The ripe olive, the fruit of *Olea Europea,* is now quite common in our markets. The introduction of olive-tree culture into California is responsible for the appearance of the ripe fruit. It is a purplish black fruit, about the size of a small plum, with a soft, dark, oleaginous pulp of a bland flavor due to the presence of the olive oil. In the fresh state, this fruit possesses a bitter, disagreeable flavor which is removed by processing in alkali and subsequently washing in water or salt water. The cultivation of a taste for the ripe olives is even more necessary than in the more common pickled green olives. The ripe olives are found both in the canned form, packed in brine, and in the dried form. The composition of ripe olives, according to the U. S. Dept. of Agriculture, is as follows: Water, 67.0 per cent.; protein, 2.5 per cent.; fat, 17.1 per cent.; sugar, 5.7 per cent.; crude fiber, 3.3 per cent.; ash, 4.4

per cent. The fuel value is 407 calories to the pound, making them one of the most valuable of fruits from this standpoint.

Paradise Nut.—Sapucaia Nut. The seed of *Lecythis Zabucajo,* a large forest tree of the Amazon valley. The seeds are borne in a large urn-shaped shell commonly known as a monkey pot, similar to that in which the Brazil or cream nuts occur. The natural dehiscence of the fruit is accompanied by a loud report as the nut case drops from the tree, the neatly fitting lid being blown off by the gases developed during the ripening, and the nuts are scattered in the dense tropical undergrowth, which makes them expensive to collect. The individual nuts are about two inches long, pointed at the ends, slightly curved and grooved and of a light brown color.

Papaw, Pawpaw.—This is not the tropical, melon-like fruit of *Carica Papaya,* which has not yet found its way to the northern markets, but is the fruit of a tree indigenous to the middle West, *Asimina triloba.* It belongs to the custard apple family and is shaped like a short banana and contains a yellowish pulp which tastes, according to some observers, like an over-ripe muskmelon. It is preferably cooked, according to most authorities.

Poke.—The young shoots of *Phytolacca decandra* are frequently found in our Eastern markets in the spring, tied up in bunches like asparagus, and are cooked and eaten like that vegetable. The poisonous and acrid qualities noted in the mature plant are entirely lacking and the flavor is pleasant.

Rose Hips.—In the northwestern part of the United States, wild roses grow in such profusion that they are almost a nuisance. They thrive under adverse conditions and in some localities the fruits, which are round, fleshy and bright red and known as "hips," could be gathered by hundreds of pounds. They are not edible in the raw state but can be made into preserves and confections, and at present a large waste of a valuable food is annually taking place.

Salads and Greens.—Many new varieties of fresh vegetables are found in our markets which are used as salads or "greens." Cress, lettuce, endive, dandelion and pepper grass are common and older forms. Corn salad, *Valerianella olitoria,* is now seen frequently, as is also purslane, *Portulacca oleracea,* and the leaves of *Caltha palustris* are sometimes seen in the markets for this purpose. The green seeds of the nasturtium are pickled and used as a condiment, and the flowers themselves are used in salads.

Sapodilla.—This tropical drupaceous fruit from *Sapota Zapo-*

tilla, is occasionally seen in northern markets and is sometimes called the "dilly." It looks like a potato and a russet apple, but the flavor is said to combine the fragrance of the jasmine and the lily of the valley with the sweetness of honey. The composition of the pulp, as given by the U. S. Dept. of Agriculture, is as follows: Water, 77.9 per cent.; protein, 0.5 per cent.; fat, 1.6 per cent.; sugar, 16.6 per cent.; crude fiber, 2.8 per cent.; ash, 0.6 per cent. The food value is very high, as it contains 425 calories to the pound.

Soy Bean. Soja Bean.—This important, oriental legume, derived from *Glycine hispida* (*Dolichos soja*), is coming to be used as a forage crop and a land improver, and is slowly obtaining a place as a foodstuff of importance. It is peculiarly different from beans in that it contains much more protein and much less starch and contains a large amount of fat, which brings the calorific value up very high. The composition is as follows: Water, 8.25 per cent.; protein, 36.35 per cent.; fat, 17.22 per cent.; starch, 14.18 per cent.; crude fiber, calories per pound, 1970.

Its high fat and protein content make it peculiarly adaptable to the preparation of foods resembling those made from milk, and we find described, soy bean cheese and a kind of artificial milk, besides various meat substitutes as croquettes, etc. A preparation of the soy bean is the basis of the well-known Worcestershire and other similar sauces. Among the various oriental foods and drinks of importance prepared from soy are Tao-hu, a kind of bean cheese, which when pressed into cakes are called "Tafu." Other cheese-like variants of prepared soy are "Natto" and "Miso." Soy milk is known and the richer, creamy layer which rises is known as "Yuba." "Shoyu" is a sauce-like preparation made by partial fermentation of crooked and mashed soy mixed with water and other ingredients. The composition of soy makes it necessary to supplement it in the diet with some carbohydrate food such as rice, and the combination makes a perfectly balanced ration, fulfilling all nutritive requirements. The protein of soy is noteworthy in its greater digestibility than that of proteins from other legumes. Containing little starch, the soy beans and foods prepared from them are frequently recommended and sold for diabetic food.

Spinach.—There are several variants of this well-known vegetable, which is derived from *Spinacia oleracea,* which have appeared in recent years. There is a smooth-leaved variety and one which has smaller and prickly leaves. There is also a plant known as

New Zealand spinach from *Tetragonia Expansa,* which is sometimes grown and substituted for spinach as being more hardy than the latter.

Udo.—This new vegetable, which is coming into use, consists of the blanched young shoots of a member of the spikenard or ginseng family, *Aralia cordata.* It is tender and succulent and preferably used as a basis for salads.

QUARTERLY REVIEW ON THE ADVANCES IN PHARMACY.

By John K. Thum, Ph.M., Lankenau Hospital, Philadelphia.

It must be decidedly encouraging to physicians in this country to know that the manufacture and sale of the well-known drug "salvarsan" under the name arsphenamine is now permitted and has governmental sanction. The Federal Trade Commission has given orders for the licensing of three American firms to produce and sell this product. The Trade Commission's action was taken under Section 10 of the Trading With the Enemy Act under the direction of Commissioner Fort, on recommendation of Messrs. McDonald, Rogers and Phelps, who are in charge of granting such licenses. The medical profession also has cause for congratulation in that the U. S. Public Health Service will have supervision over the manufacture of arsphenamine, for which it has prepared rules and standards to which the manufacturers must conform. This authority has been given to the Public Health Service by the Secretary of the Treasury, and the strict observance of the rules and standards are a condition for obtaining such a license.

In a paper with the title "Simple Versus Combined Drugs," Van Leeuwen, of the Pharmacological Institute at Utrecht, enters protest against recent publications by Bürgi and others who make the assertion that the potential energy of certain drugs can be augmented by combining them. These premises are purely theoretical, he says, and have not been confirmed by practical experience. This seems to be a fling at the so-called synergistic action of drugs.

Cushny, in his "Pharmacology," speaks of this general belief by physicians in such action, but he asserts that as yet no satisfactory researches on this subject have been carried out to prove or disprove this so-called synergistic action of drugs. It has been observed by many physicians that two or more purgatives prescribed together very often act more efficiently than one of them given in quantity equal to all of them. Cushny says it is impossible to explain this except by assuming that, although all are alike in their chief features, they differ in the details of their reactions, so that parts of the alimentary canal which might escape one are affected by another, and the mixture thus acts more universally than any one of the components.

It will be of interest to those in America who are acquainted with Prof. Henry George Greenish, of Great Britain, and his work in scientific pharmacy, to learn that he has been awarded the Hanbury Medal. To an American pharmacist mention of the words "Hanbury Medal" always brings to mind the first and only American pharmacist to have received this award, our dear and distinguished friend, the late Prof. John M. Maisch, the one-time professor of materia medica and botany in the Philadelphia College of Pharmacy.

The bestowal of this medal is undoubtedly the highest recognition that a pharmacist can receive for achievement in the domain of scientific pharmacy and, judging from a perusal of a brief biography of Prof. Greenish appearing in the *Pharmaceutical Journal* for October 6, 1917, the latest recipient of this signal honor is eminently worthy to take rank in pharmaceutical history with those eminent scientific men who preceded him in attaining this honor.

Anent the scarcity and high cost of glycerin and sugar the British Pharmacopœial Committee very sensibly reports that, in the national interest, the temporary withdrawal from the pharmacopœia of the official directions for the use of glycerin and sugar in the compounding of preparations is permitted. If the present conditions obtain for any length of time in this country, or get worse, which is more than likely, the revision committee of the United States Pharmacopœia should take similar action. The revision committee of the National Formulary should do likewise. The fact that the British government has specifically asked medical practitioners to refrain from prescribing these two substances is most impressive and should serve as a warning to us. The necessity for conservation is upon the whole world as never before.

The London Board of Trade has been instrumental in placing before Parliament for enactment into law a Patents and Designs Bill and a Trade-marks Bill, which seem to have been very carefully drawn, and ought to be of service in reforming the patent and trade-mark laws, from the shortcomings of which the English pharmacist suffers in a like degree with his American brethren. As American pharmacists have been clamoring for years for patent-law reform and an amelioration of its hardships, sympathy and ardent hope for success will be felt for those on the other side of the ocean who are thus striving for better things. The Patents and Designs Bill has twenty-one clauses, and if honestly administered should be largely instrumental in "preventing the abuse of monopoly rights."

American pharmacists will find the following clause of interest and significant of conditions in our own country:

> "In the case of inventions relating to articles or substances prepared or produced by chemical processes, or intended for food or for medicinal or surgical purposes, the specification shall not include claims for the product, substance, or article itself, but only for the special methods or processes of manufacture; and in the case of any patent for an invention intended for or capable of being used for the production of food or medicine or surgical appliances, the Comptroller shall, unless he sees good reason to the contrary, grant to any person applying for the same, a license limited to the use of the patented method or process for the purposes of the preparation or production of food, medicine, or surgical appliances, but not otherwise; and with a view to making the food, medicine, or surgical appliance available for the public at the lowest possible price, the Comptroller, in settling the terms of such a license, shall fix the royalty or other consideration payable at such an amount as will secure to the patentee the minimum profit consistent with his deriving a reasonable advantage from his patent rights.
>
> "Any decision of the Comptroller under this section shall be subject to appeal to the court."

This clause should prevent extortionate prices for chemicals by those holding patent rights or registration of a trade-mark for an article manufactured from an expired patent.

There is every prospect that the scarcity of veronal and novocaine will, in the near future, be relieved. Three American firms have been granted licenses to manufacture and sell these important drugs. This right to manufacture products hitherto controlled by enemy aliens under American patents is granted by the Federal Trade Commission. One firm has been licensed to make and sell veronal under a non-exclusive name, and this name to be the word "barbital" It has also been decided that this new name together with the scientific name, diethylbarbituric acid, must be printed on all packages containing the drug. It has also been granted that the name veronal may be used on the package to aid in distinguishing the drug. One of the requirements is that the firm manufacturing the drugs must pay to the alien firm holding the American patent five per cent. of its gross receipts on the sale of the drug. The Federal Trade Commission reserves to itself the right to fix the price of these drugs and to judge the quality of the drugs manufactured. All this is as it should be. And furthermore the Commission should see that the American public is not compelled to pay exorbitant prices for these really necessary and valuable drugs. Two other firms have been given the privilege to make novocaine, to which has been given the name procaine.

Drs. Schamberg, Kolmer, Raiziss, and Gavron embody in a paper appearing in the *Journal of the A. M. A.*, Jan. 19, their result of experimental studies of the mode of absorption of mercury when applied by inunction. How the mercury reaches the blood stream by inunction has been a much mooted question for many years. Welander, of Stockholm, after much clinical investigation, announced that the greater part of the mercury applied by inunction is volatilized and absorbed through the lungs. He received much support in his contention from other clinicians. As a result of his work he advised light smearing of the skin with mercurial ointment instead of vigorous rubbing in. He also advised inhalation cures, using bags containing mercury in powder form and worn around the neck at night.

In a rather novel manner the authors seem to have proved the dominant route of absorption when mercury is used on the skin.

They constructed a box to domicile two rabbits, one to be rubbed with mercury and the other to be made to breathe the mercury-containing atmosphere. The rabbit who had received inunctions had his head projected through the outside of the box, in such manner that it could do itself no harm. The other rabbit received no inunctions but was compelled to constantly breathe the mercury volatilizing from the other's skin. In order to facilitate absorption those rabbits who received inunctions had their hair removed with a depilatory, barium sulphid being used for this purpose.

The experimental studies were repeated five times, ten animals being used altogether. After giving in detail their work they give the following conclusions:

1. Animal experiments demonstrate that the chief avenue of absorption of mercury, when applied by inunction, is the skin.

2. Rabbits may be fatally poisoned with mercury by inunction, even when no opportunity of absorption through the lungs exists.

3. Rabbits breathing a mercury-laden atmosphere may absorb considerable quantities of mercury through the lungs, but, as a result of our experiments, we believe the respiratory absorption to be far less important than the cutaneous absorption.

4. Metallic mercury in the form of the official mercurial ointment is more volatile and is more apt to be absorbed by the lungs than calomel ointments of equal strength.

5. Calomel ointments are fully as well absorbed through the skin as the ordinary blue ointment; indeed, we have the impression that calomel is absorbed with greater facility.

6. There appears to be no reason why calomel inunctions should not supplant the unclean blue-ointment rubbings which have been so long in use.

One cannot help but remark the unfairness of the formulas allowed for medicating alcohol for sale direct to the public by the pharmacist. That there is a legitimate use for alcohol by the laity cannot be gainsaid. Many people are in the habit of using alcohol for rubbing and bathing purposes. Nothing is more grateful to the tired athlete than a brisk rub with alcohol. Many masseurs find it indispensable in their work.

Who can say with positiveness that alcohol containing one per cent. of phenol, or 1 part of formaldehyde in 250 parts of alcohol, is absolutely harmless? Who among us, knowing the possibilities of harm, would be willing to be rubbed or bathed with alcohol containing bichloride of mercury or lysol?

The regulations state that the containers of alcohol so medicated(?) should bear a "poison" label. So they should. That is just what such an alcohol would be. POISONOUS! No question about it.

It is unfair to the people to compel them to go to their physician and pay a fee for a prescription to get a harmless medicated alcohol. The added tax on alcohol makes its purchase onerous enough.

It is quite possible to make an undrinkable alcohol and yet at the same time usable externally as a liniment or for bathing purposes by permitting the addition to it of a small quantity of alum and camphor. Alcohol so treated cannot be recovered by distillation and the veriest toper would not be tempted to drink it. In Treasury Decision 1969, amending T. D. 1757, prescribing formulas for denaturing alcohol withdrawn for scientific purposes under section 3297, Revised Statutes for use in hospitals and sanitariums, there are two formulas allowing simply alum and camphor in certain proportions. Either of these would answer every requirement for external use and could not be used internally. They are formula number one and number five and are as follows:

Formula No. 1.

Alum	10 grains
Camphor	3 "
Alcohol	4 ounces

Formula No. 5.

Alum	1 dram
Camphor	1 ounce
Alcohol	1 pint

Undoubtedly if the organized pharmaceutical bodies of the country present their side of the case, and point out the injustice to the laity of the present formulas, the Treasury officials will permit a greater latitude in the choice of recipes for denaturing or medicating alcohol.

DEVELOPMENT OF ORANGE-OIL INDUSTRY IN JAMAICA.[1]

The earthquake that in 1908 laid Messina in ruins and caused a setback to the Sicilian production of essential oils gave the first important impetus to the new orange-oil industry in Jamaica. Previous to that time Sicily had been the chief source of supply of the oils of orange and lemon, and until large stocks were lost during the earthquake there was practically no sale for West Indian orange oil. There is a difference in chemical constituents between the Jamaican and the standard Sicilian oil and buyers were not inclined to change and thus risk altering the flavor of their products. The adequacy of supply of the standard oil to which they were accustomed also militated against the Jamaican oils finding a market except at lower prices.

The prices of orange oil rose on account of restricted supplies and the prospects of reduced production, and the rise marked an opportunity for Jamaican oranges.

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[1] Abstract from report of Charles L. Latham, consul, Kingston, Commerce Reports.

The principal use for which Jamaica orange oil is sold is in the manufacture of fancy biscuits, particularly of a wafer biscuit which is extensively used in the United States with ices and iced drinks. Sales of the Jamaica oil also are made to drug manufacturers.

The essential oil of orange is contained in the small cells that form the outer layer of an orange skin. It has simply to be drawn off by tapping the innumerable tiny oil cells and collecting and saving the volatile fluid. It must not be diluted with the orange juice, and must not be exposed for more than a brief time to the light and air. It should not be extracted with anything made of iron or steel, or the delicate product will be injured. It should be kept in air-tight and absolutely clean receptacles. It is rather liable to deterioration, and great care in handling is necessary.

The method that is practically the only one in vogue for the production of orange oil in Jamaica employs what is known locally as a "rinder," or escuelle, though the latter term really applies to a more elaborate machine, such as is used in Messina. The rinder is a shallow copper basin coated with tin on the inside and studded thickly with sharp copper tacks of about three quarters of an inch in length, pointing inward and upward. At the bottom of this vessel in an oil-collecting receptacle, which is shaped like the spout of a funnel, with the larger end opening into the basin and the small end closed. Some of the rinders are made locally and do not have a very finished appearance. The tendency has been to make the points too long, too sharp, and uneven. The rinder is held between the knees of the operator, who is seated, and with the open palm of the hand the orange is rolled lightly over the points of the tacks. These prick the cells of the rind, and the oil oozes out. The orange is ordinarily rolled until no more oil exudes. When the funnel is filled the oil is poured through a piece of cloth into an ordinary bottle which holds a quart or less.

At this stage of the process the oil frequently is found to contain some orange juice, and at times a mucilage. These foreign substances sometimes make it necessary that the oil be permitted to settle. Thereafter it is carefully drawn off and filtered. The rinding, though a simple operation, requires some care and skill. The length and evenness of the tacks in the rinder are important factors for the extraction of the oil without great waste. They should prick the orange skin only. If they are uneven, or too long and sharp, either all of the orange oil will not be extracted without increased labor, or the orange juice will come through and make extra filtering necessary, with its attendant waste.

Several attempts have been made in the past to introduce machinery to supplant the simple rinder now in use. These have met with but little success. The rinding in Jamaica usually is done by women or children who work for small wages.

Very little oil can be taken from the skin of each orange, so that considerable labor is necessary to get even a pound, and the quantity of oranges consumed is very large. The trees are scattered, and the gatherers, principally girls and young boys, are sent out into the properties to gather the fruit and collect the oil on the spot. They soon become very expert. By this method they have only to carry the oil to the manufacturers, the fruit being left on the ground.

The picking is done in the early hours of the day; the rinding should be done immediately in order to get the greatest quantity of oil of the best color. The fruit should be picked when full, but not entirely ripe, as in the latter condition the oil has a deeper color and brings a lower price.

If the picking and rinding take place during the heat of the day the yield is smaller than when done at a lower temperature. The operator sometimes sits on a box, the rinder being attached to an arm extending in front. A good worker will get 2½ pounds of oil from 1,200 oranges.

By far the greater amount of orange oil produced in Jamaica is of the sweet variety. Bitter orange oil is produced in exactly the same way as the sweet oil, except that the bitter oil is obtained from the Seville or sour orange, and is not as valuable as the sweet oil. When the latter is being sold at $1.75 a pound, the producer of bitter oil counts himself fortunate if he succeeds in obtaining $1.25. The bitter oil is used also to flavor cakes and biscuits and, to a lesser degree, in the preparation of perfumes and essences.

NEED FOR PATENT-LAW REVISION. REPORT OF THE COMMITTEE ON PATENT-LAW REVISION OF THE COUNCIL ON PHARMACY AND CHEMISTRY OF THE AMERICAN MEDICAL ASSOCIATION.[1]

At the present critical time when the efficiency of this nation must be raised to the highest point, it is essential that the United States government should lead in the efforts tending to such increased efficiency. To bring this about the government must protect and stimulate science, art and industry and at the same time curb or prevent waste of the country's resources. In this field the United States Patent Office has unlimited power for good and evil—good, in the issuance of patent grants for novel devices and substances which go to increase national efficiency; evil, in the granting of patent protection where such protection is not in the interest of national efficiency, conservation of energy and material resources.

For years the American Medical Association, in common with the national pharmaceutical bodies, has been urging the amendment of the law which governs the issuance of patents on medicinal preparations and more particularly revision of the procedure under which such patents are issued. At the Chicago (1908) meeting of the American Medical Association a special committee of five was appointed by the House of Delegates to study the questions involved, and to coöperate with the Association's committee on medical legislation in preparing and securing the enactment of a bill which would correct the abuses connected with the enforcement of our patent laws (*The Journal A. M. A.*, June 13, 1908, p. 2003). This committee presented a comprehensive report at the Atlantic City (1909) meeting of the American Medical Association (*The Journal A. M. A.*, June 19, 1909, p. 2063). A further report was presented at the St. Louis (1910) meeting of the American Medical Association (*The Journal A. M. A.*, June 18, 1910, p. 2079). In 1911 (*The Journal A. M. A.*, November 25, 1911, p. 1780) the Council on Pharmacy and Chemistry of the American Medical Association issued a report which set forth the inadequacy of our patent laws as they are administered in relation to medical products particularly.

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[1] From the *Journal of the American Medical Association.*

Against Public Interest.—Since that time the Council has continued its study of the U. S. patent law as it applies to medicine and has become convinced that in many instances the patent law or its enforcement is contrary to the best interest of the public, both as concerns health and prosperity. The Council feels it a duty at this time to protest against the provisions of our patent law, or the methods of its enforcement, which permit the granting of patents without thorough and scientific investigation of the claims advanced in such letters patent. As one means of improving conditions the Council urges that the U. S. Public Health Service, the Bureau of Chemistry, U. S. Department of Agriculture and other scientific departments of the United States government conversant with medicines and related subjects be consulted before the issuance of patents on medicinal preparations.

In support of the Council's contention that the patent law procedure requires revision, the following is offered: In 1912 a U. S. Patent (No. 1,031,971) was granted on a cresol derivative, metacresyl acetate, a product described in chemical literature in 1903. When the Council inquired as to the grounds for the issuance of a patent for a substance known to science, the Patent Office replied that it was not familiar with the publication in which metacresyl acetate had been described. It seems evident that this patent would not have been issued had the application first been submitted to a government department familiar with chemical literature.

An illustration of the granting of a patent on the use of well-known chemical bodies which present no discovery or originality is the patent issued for the use of peroxids, perborates and percarbonates as ingredients of tooth powders (U. S. Patents Nos. 760,397 and 802,099). Regarding these patents *The Journal of the American Medical Association* (Sept. 20, 1913, p. 978) commented:

> The patents held by McKesson and Robbins give this firm the exclusive right of manufacturing tooth powders containing peroxids, perborates and percarbonates. It is another illustration of the unfair monopolies that may be secured under our present patent laws.

Granting a Patent to a Nostrum.—Again in 1913 U. S. Patent No. 1,081,069 was granted to a citizen of Switzerland (a country which does not grant patents on medicinal preparations) for a "composition which is intended to be used internally and which confers to the organisms immunity against the following microbial infectious illnesses: *diphtheria, pneumonia, typhus, scarlet fever, influenza, septic infections, cerebral-spinal meningitis, syphilis, pest, cholera and tuberculosis; it is also effective in another kind of disease, viz., goiter."* (Italics not in original.) The patent specification states that "the principal of these substances in creatinin . . . ," but offers no evidence whatever that this well-known chemical body has the extensive and miraculous powers claimed for it. In publishing a notice of this patent *The Journal of the American Medical Association* (Jan. 3, 1914, p. 54) explained:

> "It appears that the inventor is dead, and that his estate took out the patent. Since this great benefactor should have been, by the use of his preparation, immune to practically all diseases, he must have died of senility, although this seems hardly to have been the case."

and held:

> "Assuredly granting patents on such claims ought to be sufficient to show the need of a change in the methods of granting patents—at least of the methods governing the issuance of patents for medicinal products."

We submit that had the department of the government entrusted with the enforcement of the federal Food and Drugs Act been consulted as to the claims of this patent, it would probably have advised that, if the absurd and palpably fraudulent claims set forth in this application for a patant were made on the label of a preparation of creatinin offered for sale in interstate commerce or in the District of Columbia, the vendor would be prosecuted.

In 1914 there was issued U. S. Patent No. 1,086,339. Here the "inventor" declared:

> "It is the object of my invention to destroy parasitic microörganisms, particularly on living tissue without injuring the latter, by progressively evolving sodium hydroxid contiguous to said tissue, from and in a moist mixture of calcium hydroxid, sodium carbonate, aluminum sulphate and boric acid, . . ."

In a word, this patent apparently was granted for the production of sodium hydroxid by a chemical reaction which had been in use for several centuries. Because the patentee had twisted the granting of this patent into a quasi-endorsement of his nostrum, the Council's consideration of this preparation was sent the Patent Office as a protest against the present law, which authorizes the granting of patents on unproved and improbable medical claims. At that time the Council was informed by the Patent Office that reforms in the issuance of patents for medicinal substances had been instituted, and that "the trouble will not be so pronounced in the future as it has been in the past."

Flavoring Epsom Salt a "Discovery."—There was issued early in 1917 U. S. Patent No. 1,212,888 for a method of flavoring Epsom salt—yet this "discovery" is a procedure which has been practiced ever since the cathartic action of this bitter salt has been known. Not only does the patent describe a process long known to physicians and pharmacists, but it sets forth claims that the flavored cathartic salt produced by the process cures flatulency, indigestion, sick and sour stomach, colic and destroys worms. In commenting on this patent *The Journal of the American Medical Association* (June 23, 1917, p. 1914) was constrained to remark:

> "The splendid conception of the framers of our constitution in providing a plan for promoting progress in science and useful arts by granting to inventors for a limited time the exclusive use of their inventions, in exchange for the publication of full knowledge thereof, is being debased. No branch of our government is of greater importance to the progress of the country than the patent office, provided that office is intelligently administered. When the patent office is used, however, for an extension of the nostrum business, founded on the abuse of patent and trade-mark laws, it becomes a menace to the public health. The objects of the patent law are being defeated by the practices of the patent office."

Still further, attention is called to U. S. Patent No. 1,226,394 for a process of making hexamethylenamin tetraiodide and on the product so produced. This patent was issued after the council had notified the Patent Office that hexamethylenamin tetraiodide had been discovered in 1888 and that a process identical in principle with that for which patent application appeared to have been made was published in 1916. On the basis of claims for which no evidence is produced this patent is issued for a well-known substance on the ground that as previously produced it contained a little free iodine or that the known processes were less economical. This patent appears to be an illustration of our patent procedure which obliged American users of acetylsalicylic acid to pay an exorbitant price because this country granted a patent which gave to the patentee, a foreigner, the exclusive right to the manufacture of the substance, whereas no such patent was issued in the patentee's own country, nor, as far as we can learn, in any other country. It forcibly illustrates the need for a revision either of our patent laws or of their methods of enforcement or both.

The Beveridge Patent.—In further justification of the Council's protest against the provisions of our present law, or the methods of its enforcement, which permit the granting of patents without thorough and scientific investigation of the claims advanced in such letters patent, the Council calls attention to the report, appearing above, of an investigation made by A. J. Carlson, A. E. Kanter and I. Tumpowski, "The Question of the Stability of Secretin," which relates to U. S. Patent No. 1,181,424, issued to James Wallace Beveridge.

Whereas the regulations governing the issuance of patents demand that the processes shall be described in such detail that one versed in the sciences can confirm the claims made by the patentee, no pretense whatever of fulfilling this requirement is made in the patent specifications of this patent. The substance of the first three paragraphs of this patent has long been general knowledge. Nearly every sophomore medical student has himself performed, or seen performed, such "experiments" as are therein described. The claims of novelty evidently are confined to the assertion that the preparation is able to "resist oxidation or deterioration"; that it is free from "poisonous and irritable chemical substances"; that it may be administered orally to produce the desired physiological action," etc. Not the slightest hint is given as to how any person can substantiate these claims. As a matter of fact, the investigation of Professor Carlson and his co-workers has shown that a preparation having the properties claimed cannot be made by the process described in this patent. Any one familiar with the subject could have demonstrated readily that the applicant was withholding information concerning essential features of his process, assuming that he had any information on the subject (which he probably did not have), and would have advised against the issuance of the Beveridge patent.

THE CHINESE MUSK INDUSTRY.[1]

Musk is one product of world commerce in which China practically enjoys a monopoly—not a large one, to be sure, since the annual output is at best only some $400,000 gold, but the product itself is worth many times its weight in silver, and for that matter, gold as well, in these days of high exchange.

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[1] Extract from The Far Eastern Review for October, transmitted by Consul G. C. Hanson, Chungking.

About one half of the total output stays in China and is used especially by the Cantonese in compounding pills that form the best-known remedy in the Chinese pharmacopœia for Asiatic cholera. The Chinese also use musk to keep moths out of furs and clothing, and as a perfume, the odor being quite popular in the better grades of perfumery.

Practically all of China's musk comes from Tibet through the Szechwan frontier, the chief markets being Sungpan and Tachienlu, the former being by far the more important. Sometimes, when the road from Sungpan to Chengtu is unsafe, owing to brigands, part of the musk will be taken south and marketed in Tengyueh to go to India. This happened to a considerable part of the output in 1915, when 6,890 ounces out of a total of 25,367 were so shipped. The value of the 1915 musk crop was $266,000 gold. In 1916 some 25,160 ounces, valued at $407,000 gold, were shipped. Because of its commanding position in the perfume industry France has been the largest purchaser of China's musk, the United States being second; but in 1915 the United States forged ahead and bought more than a quarter of the entire output.

Good musk is bought for 10 times its weight in silver at Sungpan, and at Chungking for 18 to 25 times, so there is a heavy profit somewhere. Small supplies are brought out to various points along the Lungan road, where every coolie seems to have some about him, and the inns reek with the sickly smell. The musk is brought down in its pod, and the best kind is recognized by a nice brown color, and in its pure state by its overpowering stench; pods with grayish or dull-colored musk are rejected. It is retailed by one one-hundredth of an ounce, but it is adulterated more than any other article in the Chinese market.

By far the largest herds of musk deer are to be found on the southern shores of the Koko-Nor, and the supply of musk there (at T'aochou) is larger than the quantity that comes through Sungpan. In fact, great quantities of musk do not come to Sungpan at all, but are sent east to Yuchow, in Honan, where a fair is held in the ninth and tenth moons, many of the Sungpan traders visiting this place. At Tachienlu musk is the most valuable export, practically every hong reeking with it, and nearly all the Tibetans who come from the far interior bring some with them. The price of medium musk there is 13 times its weight in silver.

Musk is a secretion of the male musk deer. Three kinds of musk are distinguished in commerce, the most important and valuable being the Chinese or Tongkin musk, imported principally from Shanghai. It is put up in small tin-lined, silk-covered caddies, each containing from two to three dozen pods. These are generally adulterated with dried blood, fragments of leather, leaden pellets, peas, etc., so that often little more than the smell of the original tenant of the pod remains. The Chinese pods vary greatly in value according to quality and genuineness. Some musk collected from the western Himalaya is exported from India. It is much less prized than genuine Tongkin musk. The third variety, known as Kabardine, or Siberian musk, is exported from Central Asia by way of Russia. It is in large pods, said to be yielded by a distinct species of deer, and is very inferior in point of odor.

Good musk is of a dark purplish color, dry, smooth, and unctuous to the touch and bitter in taste. A grain of musk will distinctly scent millions of cubic feet of air without any appreciable loss of weight, and its scent is not only more penetrating but more persistent than that of any other known substance. As a material in perfumery it is of the first importance, its powerful and enduring odor giving strength and permanency to the vegetable essences, so that it is a principal ingredient in nearly all compounded perfumes.

Musk, or some substance possessed of the musk odor, is also contained in glands in the jaw of alligators and crocodiles, whence it has been extracted for use in perfumery in India and Egypt. The musk ox and the muskrat (Indian and European) are, as their names indicate, remarkable for a musk odor. The musk deer differs from the typical members of the deer family and stands by itself as an isolated zoölogical form, as both sexes are entirely devoid of any sort of frontal appendage and the upper canine teeth of the males are remarkably developed—long, slender, sharp-pointed, and gently curved, projecting downward out of the mouth with the ends turned somewhat backward. Among the anatomical peculiarities in which it differs from all true deer is the presence of a gall-bladder.

The musk deer has a wide distribution over the highlands of central and eastern Asia, including the greater part of southern Siberia, and extends to Kashmir on the southwest and Cochin China on the southeast, always, however, at great elevations—being rarely found in summer below 800 feet above the sea level, and ranging as high as the limits of the thickets of birch, rhododendron, and juniper, among which it conceals itself in the daytime. It is a hardy, solitary and retiring animal, chiefly nocturnal in its habits, and almost always found alone, rarely in pairs, and never in herds. It is exceedingly active and sure-footed, having, perhaps, no equal in traversing rocks and precipitous ground; and it feeds on moss, grass, and leaves of the plants which grow on the mountains among which it makes its home.

Most of the animals of the group to which the musk deer belongs have some portion of the cutaneous surface peculiarly modified and provided with glands secreting some odorous and oleaginous substance specially characteristic of the species. The situation of the specially modified portion of skin is extremely various, sometimes between the toes, as in sheep, sometimes on the face in front of the eyes, as in many deer and antelopes. Sometimes it forms a distinct pouch or sac. This is the form taken by the special gland of the musk deer. It is found in the male only, and is a sac about the size of a small orange, situated beneath the skin of the abdomen. The secretion with which the sac is filled is of dark-brown or chocolate color, and when fresh is described as being of the consistency of "moist gingerbread," but becomes dry and granular after keeping. When the animal is killed, the whole gland, or "pod," is cut out and dried, and in this form reaches the market of the Western world, chiefly through China.

Owing to the great value of musk to the perfumer, the chemist early tried to solve the problem of making it artificially, and finally one Baur accidentally succeeded in imitating the odor in a compound made by linking the radicle of benzene and that of tertiary butyl alcohol. It is not a true musk, as the natural product belongs to quite a different class of chemical compounds. However, "Musc Baur," as it was called in the trade, enjoyed great popularity and sold for $20 gold a pound as far back as 1900, the product so sold being adulterated with 19 times its weight of acetanilid.

There are other artificial musks in the market now and the adulteration with inert chemicals has ceased. None of these, however, has the power that makes the product of Tibet so valuable, that of fixing the more fugitive floral odor and giving the resulting perfume lasting qualities that are lacking in cheaper grades, whose odor is sweet when moist but vanishes as the solution dries.

SELECTED FORMULAS OF THE MILITARY HOSPITALS FROM THE CHEMIST AND DRUGGIST DIARY.

Acriflavine Pastes.

Devised as a wound-dressing by Colonel C. J. Bond, F.R.C.S.

The suppurating wounds are packed with acriflavine paste after preliminary surgical sterilization and drainage.

The following are the different kinds of acriflavine paste:

1. Acriflavine soap paste is made by neutralizing stearic acid with sodium carbonate in the proportion of 1 part of sodium carbonate to 1¾ parts of stearic acid with the addition of 0.1 per cent. of acriflavine. The soapy compound so prepared is canary yellow in color and firm in consistence.

2. Acriflavine gelatin is made by heating French gelatin in water with the addition of acriflavine 0.1 per cent. The consistence of the jelly is determined by the amount of water added.

3. Acriflavine starch mucilage is made by adding boiling water to starch with the addition of 0.1 per cent. of acriflavine; 1 part of starch to 10 of water forms when cold a thick mucilage.

It is stated that the soap form (No. 1) is most used at present. —*British Medical Journal.*

Alderson's Glycerin and Ichthyol.

Used in place of boric fomentations.

Ichthyol	10 parts
Glycerin	90 parts

Ambrine Imitations.

Dr. Barthe de Sandfort, a French medical man, first devised a method of treating burns by coating the wounds with a film of paraffin wax. He employed "Ambrine," a preparation consisting chiefly of paraffin wax (m. p. 48.6° C.) with small amounts of fatty oil, an asphalt-like body, and coloring-matter. The melted wax is sprayed on the burn. The following formulæ have been published of imitations of ambrine:

"No. 7 Paraffin."

(Lieut.-Colonel A. J. Hull.)

Resorcin	1 part
Eucalyptus oil	2 parts
Olive oil	5 parts
Soft paraffin	25 parts
Hard paraffin	67 parts

"No. 7 Paraffin." Modified.

Beta-napthol	0.25 part
Eucalyptus oil	2.0 parts
Olive oil	5.0 parts
Soft paraffin	25.0 parts
Hard paraffin	67.75 parts

Russian Formula.

(Surgeon-General Eugene Hurd.)

Resin	1 part
Beeswax	1 part
Paraffin wax	4 parts

Melt in a dish set in boiling water for half an hour.

Asphalt-Paraffin No. 21.

(Leech's formula.)

Paraffin wax (m. p. 47.2°C. by U. S. P. method)	97.5 Grams
Asphalt	from 3 to 5 drops
Olive oil	1.5 Cc.

The asphalt is obtained by evaporating 10 Cc. of asphalt varnish on a steam-bath for half an hour. From three to five drops of the product is placed in a casserole with the olive oil, and stirred to effect complete solution. To this is then added, with stirring, the paraffin, previously melted.

BISMUTH-AND-IODOFORM PASTE.

"B.I.P.P."

Bismuth subnitrate	1 Oz.
Iodoform	2 Oz.

Liquid paraffin to make a thick paste.

Professor Rutherford Morison employs this as a packing for the cleansed wound, which is then covered with gauze and an antiseptic pad, kept in place with sticking plaster and a bandage.—*Lancet.*

BODY-VERMIN KILLER.

Devised by Mr. Langford Moore, pharmacist at St. Bartholomew's Hospital, London.

Hydrarg. ammon.	℥j
Zinci oxidi	℥ss
Magn. silicat.	℥ss

Ft. pulvis.

Apply to the infested area on a lint pad or by means of a pepper-box. The powder may also be used as a prophylactic dusted on the underclothing and the body.—*Lancet.*

BORSAL.

Boric acid, Salicylic acid	equal parts

As a first dressing was found by Sir W. Watson Cheyne "very efficacious against infections by bacilli of tetanus and gas gangrene."—*Lancet.*

CRESOL PASTE.

(Sir Wm. Watson Cheyne.)

Cresol 20 per cent. in a basis of lanoline and wax.

As a first dressing is placed on the wounds.—*Lancet.*

CRUDE-OIL OINTMENT.

Devised by Mr. A. D. Peacock, M.Sc., for killing body vermin.

Crude tar oil	4 Oz.
Soft paraffin	2 Lb.

Mix.

Anoint the body from the neck to the knees and afterwards wash off.

CRUDE-OIL EMULSION.

Professor Maxwell Lefroy's formula.

Whale-oil soap	10	Lb.
Crude Barbados petroleum	5½	pints
Naphthaline	4	Oz.

—*West Indian Bulletin.*

LENTHAL CHEATLE'S SOLUTION.

Used for sterilizing wounds.

A.

Mercury perchloride	1.0
Spirit (industrial), 80 per cent.	100 Cc.

B.

Malachite green, pure	1.0
Spirit (industrial), 80 per cent.	100 Cc.

For use mix equal parts of *A* and *B*. The liquid is sprayed on to the wounds.—*Lancet.*

HYDRION.

Wound antiseptic, devised by Dr. Thos. Lissaman, Bolton.

Mercury perchloride	4.375 grains
Calcium chloride	1.86 grains
Sodium chloride	34.76 grains
Potassium chloride	0.076 grain

Make into 40-grain tablets. One tablet is dissolved in a pint of water to make an antiseptic solution.

MADDEN'S BALSAM.

Used in the treatment of lacerated and dirty gunshot-wounds. The balsam is placed in the wounds after they have been cleansed with iodine or cyllin (1–2,000).

Eucalyptol, Guaiacol, Iodoform, of each	10 parts
Peru balsam	30 parts
Ether	100 parts

Mix.

—*Lancet,* 1916, I, 613.

N. C. I.

Vermicide devised by Mr. A. D. Peacock, M.Sc.

Naphthaline (crude)	96 parts
Creosote	2 parts
Iodoform	2 parts

The powder must not be used too freely as severe smarting may be caused. Dr. J. Parlane Kinloch finds that the iodoform in this formula is useless; it is best to replace it with French chalk.—*British Medical Journal.*

MASTISOL WOUND DRESSING.

I.

Mastic	20 Grams
Chloroform	50 Grams
Linseed oil	20 drops

II.

Resin	15 Grams
Sandarac	15 Grams
Benzol	70 Grams
Ethyl benzoate	5 Grams

III.

Nordmann's formula.

Mastic	20 Grams
Benzol	50 Grams
Linseed oil	20 drops
Resin	10 Grams
Venice turpentine	7 Grams

IV.

Van Itallie's formula.

Mastic	20 parts
Resin	20 parts
Castor oil	3 parts
Methyl salicylate	1 part
Benzol	56 parts

V.

Austrian Home Office formula.

Mastic	200 parts
Resin	100 parts
Venice turpentine	70 parts
Linseed oil	5 parts
Wintergreen oil	1 part
Benzol	500 parts

VI.

Max Page's formula.

Resin	50 Grams
Venice turpentine	5 Grams
Methylated spirit	50 Cc.
Benzine	25 Cc.

SELECTED PHARMACEUTICAL FORMULAS FROM THE CHEMIST'S CALENDAR.

ANTI-CATARRH SMELLING-SALTS.

Phenol	Gr. xxx
Menthol	Gr. xxx
Ammon. carb. contus.	℥iss
Pulv. carbonis ligni	℥ss
Liq. ammon. (0.880)	♏xx

Mix loosely. This may be filled into bottles or into tubes plugged at each end with cotton-wool.

PROPHYLACTIC MOUTH-WASH.

Phenol	ʒss
Boracis	ʒj
Liq. formaldehyd.	♏xx
Sp. chlorof.	ʒij
Aq. menth. pip.	℥iv
Aq. dest. ad	℥vj

About a tablespoonful with a wineglass of water for use. Should be retained in the mouth an appreciable period to let it penetrate between the teeth.

BALSAMIC MOUTH-WASH.

Myrrhæ	ʒj
Acid. benzoic.	Gr. x
Boracis	ʒiss
Tinct. krameriæ	℥ss
Aq. chlorof. ad	℥viij

Triturate the myrrh with the borax and benzoic acid and a little of the chloroform-water, then add gradually the remainder of the water. May be used as it is or diluted to taste.

PETROLEUM EMULSION.

Paraff. liq.	℥iv
Gum. acaciæ	ʒxiij
Tragacanth. pulv.	ʒj
Aq. dest. ad	℥xij

Make a mucilage with 5 ounces of the water and the gums, then add to it gradually, with steady stirring, the liquid paraffin; when the emulsion is established the remainder of the required water to be incorporated.

The dose is a teaspoonful to a tablespoonful.

For children this is an excellent preparation. It is mildly laxative and exercises an antiseptic influence on the intestinal tract, preventing, it is suggested, the formation and absorption of toxins.

When hypophosphites are desired in the emulsion they can be dissolved in a portion of the water and added before making up to measure. Sweetening and flavor are frequently added to the emulsion; on the whole, however, there is much to be said for the plain form.

LINIMENT FOR RHEUMATISM.

Menthol	ʒij
Chloroform	ʒiv
Ol. terebinth.	℥j
Acid. acetic	℥j
Lin. camph. ad	℥iv

To be well rubbed over the seat of pain.

FOR CRACKED LIPS.

Menthol	Gr. ij
Zinc. oxid.	Gr. xxx
Adipis lanæ hydros.	ʒiiss
Paraff. moll. alb.	ʒss
Hydrarg. bisulph.	Gr. ij

Mix intimately. To be packed into the cracks and renewed frequently. Promotes rapid healing.

A good lip-salve for ordinary use.

BENZOINATED COLD-CREAM.

Cetacei	℥j
Ceræ alb. ver.	℥ss
Ol. sesami	℥iv
Aq. rosæ	℥j
Tinct. benzoini simp.	ʒj
Synthetic otto	♏x

Melt the spermaceti, wax, and sesame oil together with as little heat as will serve, beat in the rose water and tincture of benzoin, previously mixed, and finally introduce and mix intimately the otto.

An excellent application for the face to clean and soothe after exposure to the weather; it should be massaged over the skin, then wiped off with a soft cloth. In the morning only warm water should be used, no soap in washing, and the protective effect of the trace of cream remaining on the skin will be appreciated. This applies particularly to dry skins. The cream is a type of the preparation commonly described as "skin-foods."

LOTION FOR SPOTS ON THE FACE.

Acid. salicylic.	Gr. xv
Zinci carb.	ʒiss
Pulv. tragacanth. ver.	Gr. vj
Glycerin	ʒj
Spirit. rect.	ʒj
Aq. rosæ ad	℥ij

Mix the first two; make a mucilage with the spirit, tragacanth, and rose water, and add to it the glycerin. Then triturate the first two with a little of the mucilage and glycerin, and add gradually the remainder.

This should be smeared on at night and allowed to dry on; a little may be used in the morning.

Spots should be treated with an antiseptic to kill off the germs and prevent a new crop. The zinc soothes the concurrent inflammation, while the salicylic acid acts as the germicide.

FURNITURE-OIL.

Acid. acetic. dil.	℥xij
Ol. lini	Oiss
Sp. terebinth.	℥viij
Liq. antim. mur.	℥ij
Spirit. meth.	℥xvj

Shake well together. Industrial spirit to be used if permitted.

FURNITURE CREAM.

Ceræ flav.	℥iss
Ceræ alb. ver.	℥ss
Saponis duri	℥ss
Ol. tereb.	Oss
Aq. dest.	Oss

By means of a water-bath dissolve the waxes in the turpentine and the soap in the water; mix the two solutions and shake. A nice white cream of good pouring consistence.

Hair-lotion for Dandruff.

Resorcin	Gr. xl
Glycerin	ʒiss
Boracis cryst.	ʒj
Ess. lily of the valley	ʒss
Aq. dest. ad	℥vj

To be sprinkled on the scalp and rubbed in night and morning for a few days, then once a day. A clean, effective lotion.

Lavender-Water.

Ol. lavand. ang.	℥iss
Ol. lavand. exot.	℥ss
Ol. bergamot.	℥ss
Synthetic musk	Gr. ij
Civet	Gr. xx
Sp. rect.	Oiv
Aq. rosæ trip.	℥iv

Makes a very good lavender-water. Improves by keeping for six months or so.

Rose Mouth-Wash.

Synthetic otto	♏xx
Synthetic musk	Gr. j
Ess. vanilla	♏x
Ess. jasmin	♏x
Sp. rect.	℥iv

A few drops in a wineglassful of warm water to rinse the mouth.

Bath Crystals.

Sodii. carb.	1 Lb.
Synthetic otto	♏x
Ol. ylang-ylang	♏v
Synthetic bergamot	ʒss
Absolute alcohol	ʒij

Dissolve the oils in the alcohol and distribute evenly over the crystals.

This may be labelled "Cyprus Bath-crystals."

One or two ounces to a bath.

FOR SOFT CORNS.

Acid. tannic.	Gr. xl
Liq. formaldehyd.	♏v
Ol. amygdal. essent.	Gtt. j
Aq. ad	ʒij

Dissolve the tannic acid in ʒj of the water on a water-bath, transfer to a vial, add the formaldehyde solution, the essential oil of almonds, and sufficient additional water to produce 2 fl. dr.

To be applied on a pledget of cotton-wool so adjusted that it will remain in close contact with the corn. Renew night and morning.

Said to dry up the corn so that it can be picked out.

FOR HARD CORNS.

Acid. salicylic.	ʒj
Menthol	Gr. x
Collodii flex.	ʒvj
Ether. meth. (about 0.730 sp. gr.)	ʒij

This may be tinted to fancy with a small quantity of an aniline color. Indian-hemp extract, which has been the conventional color hitherto, is now too expensive. The menthol has an anodyne effect which is appreciated.

TOILET-POWDER, PINK.

Acid. boric. pulv.	℥j
Zinc oxid.	ʒij
Pulv. talci	℥ix
Boli armeniæ	q. s. (Gr. l–lx)

Perfume according to fancy.

It is well not to add much essential oil in case of interfering with the free dryness of the powder.

Synthetic otto	Gtt. x
Synthetic bergamot	Gtt. x
or	
Heliotropin	Gr. xv
Coumarin	Gr. v

serve admirably.

INTERNATIONAL ATOMIC WEIGHTS, 1918.

	Symbol.	Atomic Weight.
Aluminium	Al	27.1
Antimony	Sb	120.2
Argon	A	39.88
Arsenic	As	74.96
Barium	Ba	137.37
Bismuth	Bi	208.0
Boron	B	11.0
Bromine	Br	79.92
Cadmium	Cd	112.40
Cæsium	Cs	132.81
Calcium	Ca	40.07
Carbon	C	12.005
Cerium	Ce	140.25
Chlorine	Cl	35.46
Chromium	Cr	52.0
Cobalt	Co	58.97
Columbium	Cb	93.1
Copper	Cu	63.57
Dysprosium	Dy	162.5
Erbium	Er	167.7
Europium	Eu	152.0
Fluorine	F	19.0
Gadolinium	Gd	157.3
Gallium	Ga	69.9
Germanium	Ge	72.5
Glucinum	Gl	9.1
Gold	Au	197.2
Helium	He	4.00
Holmium	Ho	163.5
Hydrogen	H	1.008
Indium	In	114.8
Iodine	I	126.92
Iridium	Ir	193.1
Iron	Fe	55.84
Krypton	Kr	82.92
Lanthanum	La	139.0
Lead	Pb	207.20
Lithium	Li	6.94
Lutecium	Lu	175.0
Magnesium	Mg	24.32
Manganese	Mn	54.93
Mercury	Hg	200.6
Molybdenum	Mo	96.0
Neodymium	Nd	144.3
Neon	Ne	20.2
Nickel	Ni	58.68
Niton (radium emanation)	Nt	222.4
Nitrogen	N	14.01
Osmium	Os	190.9
Oxygen	O	16.00
Palladium	Pd	106.7
Phosphorus	P	31.04
Platinum	Pt	195.2
Potassium	K	39.10
Praseodymium	Pr	140.9
Radium	Ra	226.0
Rhodium	Rh	102.9
Rubidium	Rb	85.45
Ruthenium	Ru	101.7
Samarium	Sa	150.4
Scandium	Sc	44.1
Selenium	Se	79.2
Silicon	Si	28.3
Silver	Ag	107.88
Sodium	Na	23.00
Strontium	Sr	87.63
Sulphur	S	32.06
Tantalum	Ta	181.5
Tellurium	Te	127.5
Terbium	Tb	159.2
Thallium	Tl	204.0
Thorium	Th	232.4
Thulium	Tm	168.5
Tin	Sn	118.7
Titanium	Ti	48.1
Tungsten	W	184.0
Uranium	U	238.2
Vanadium	V	51.0
Xenon	Xe	130.2
Ytterbium (Neoytterbium)	Yb	173.5
Yttrium	Yt	88.7
Zinc	Zn	65.37
Zirconium	Zr	90.6

THE DEBT OF MEDICINE TO THE DISCOVERY OF DYES.[1]

The *Lancet* of July 17, 1917, calls attention to a series of articles on "Science and Industry," published in a supplement to a recent issue of the *Manchester Guardian*. There is one by Dr. C. W. Saleeby on "Dyestuffs and Medicine," in which the remarkable influence on the progress of medical science, encouraged by the discovery of coal-tar dyes, is discussed. The subject is not in the least new to medical science and scientific audiences, but is none the less interesting. As we have often pointed out, the selective action of dyes on microörganisms was a step of the utmost diagnostic value by adding to the efficiency of microscopic examinations, and now we are turning this selective action to account in the treatment of numerous infections. The dyes, in short, have laid the foundations of a system of chemicotherapeutics which promises to be of distinct importance in combating some of the worst of human ills. The discovery of a dye substance—*e. g.*, such as acriflavine—which appears to discriminate between friend and foe, only attacking the latter, suggests the possibility of finding further selective substances which are not inimical to the human organism, but destructive to the particular disease organisms which are known to have invaded the host. The possibility of successful treatment on these lines is real. Little could William Murdoch have conceived in 1792 when he distilled coal for the first time for producing gas for lighting his house —thus laying the foundations of the coal-gas industry—what great potentialities lay hidden in the distillation whose by-products now yield such an astonishing stock of valuable synthetics, antiseptics, dyes, and explosives.

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

The Utilization of the Adsorptive Power of Fuller's Earth for Chemical Separations.—In a contribution from the hygienic laboratory, U. S. Public Health Service, Atherton Seidell makes a further contribution to our knowledge of the value of fuller's earth for chemical separations (other than decolorizations).

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[1] From *The Therapeutic Gazette.*

The use of this earth for the isolation of alkaloids from plant extracts and for the separation of "vitamines" has already been reported and has claimed the attention of several investigators.

The present communication deals with the relative adsorptive power of various fuller's earths, the effect of time on the rate of adsorption, etc. Experiments with solutions of methylene blue and of quinine bisulphate show that only the free base is adsorbed when these solutions are placed in contact with fuller's earth and that when both of these chemicals are present in the solution there is a simultaneous adsorption. Experiments were also carried on to determine the effect of ethyl alcohol and of cane sugar on such adsorptive.

The following is the summary of the conclusions:

A comparison of the adsorptive capacities of 36 samples of fuller's earths and other clays showed that English earth is superior to any of the domestic fuller's earths except one, the exact source of which could not be learned. Domestic bentonite exhibits a higher adsorptive power than the English samples of fuller's earth, but on account of its exceptional capacity for retaining water, it cannot be used to advantage in cases, such as the present, where a sharp separation of solid and solution is essential.

It was found that the adsorption of quinine bisulphate and methylene blue by fuller's earth increased with time of contact but at a gradually diminishing rate. It was also found that the amounts adsorbed continued to increase with amount of excess present. Maxima were not observed in the case of either the time factor or the concentration factor.

In the case of both quinine bisulphate and of methylene blue the free base only is adsorbed from the aqueous solution when brought in contact with fuller's earth. The acid component of each compound unites with calcium derived from the fuller's earth and remains in the aqueous solution.

When equal amounts of quinine bisulphate and methylene blue are simultaneously present in an aqueous solution shaken with fuller's earth, both compounds are adsorbed to approximately the same extent. The sum of the two components is about 25 per cent. greater than the amount of either adsorbed separately.

When the same portion of fuller's earth is first shaken with methylene blue and then with quinine bisulphate, a small amount of the latter compound is taken up and only a trace of the former liberated. When the procedure is reversed, considerably more methylene blue is adsorbed and a fairly large proportion of quinine bisulphate is displaced from its combination with the fuller's earth. The results show that under the special conditions of this experiment fuller's earth exhibits a distinct preference for methylene blue.

Dilution of the aqueous solution, in the case of quinine bisulphate, does not diminish appreciably the amount adsorbed when the ratio of earth to alkaloid is approximately that required for complete adsorption. In the case of a ratio of earth which is insufficient for complete adsorption, dilution causes a distinct reduction in the amount adsorbed.

Increase of acidity of the aqueous solution, likewise, does not diminish the amount of quinine adsorbed in case the ratio of earth is just sufficient for complete adsorption. With less earth than sufficient for complete adsorption a distinct reduction in the amount of adsorbed alkaloid follows an increase in acidity of the aqueous medium.

Ethyl alcohol diminishes the adsorption only in cases where the ratio of earth used is insufficient for complete removal of quinine or of methylene blue.

The presence of quite large amounts of cane sugar was found to exert no retarding influence upon the adsorption of quinine bisulphate by fuller's earth.

In conclusion it appears that the adsorptive power of fuller's earth is exerted particularly towards certain compounds, characterized by distinct basicity and that, in the case of salts, only the base unites with the fuller's earth. No marked selectivity was found in the case of the two compounds forming the basis of the present experiments. The amount adsorbed in a given time is a function of ratio of earth to adsorbable material and, except with insufficient earth for complete adsorption, is independent of dilution, acidity or presence of non-adsorbable neutral material. (From the *Journal of the American Chemical Society,* January, 1918.)

IODINE TEST FOR HYDROCHLORIC ACID IN GASTRIC JUICE.—Scheltema remarks that the tests in vogue for this purpose allow some guesswork as to the findings. Titration with iodine is simpler and more reliable. When hydriodic acid is added to iodic acid, they act on each other with the result that water and iodine are formed. The equation is $HIO_3 + 5HI = 3H_2O + 3I_2$. This reaction can serve as a sensitive reagent for hydrogen ions. The quantity of iodine separated out can be determined with sodium thiosulphate. To 10 Cc. of filtered gastric juice are added 5 Cc. of a 5 per cent. solution of potassium or sodium iodate, and then a crystal of potassium iodide or sodium iodide. Iodine separates out at once, as is evident from the dark coloration. Then 10 Cc. of tenth-normal solution of sodium thiosulphate are added, or more, with a pipet, until the fluid is decolored, growing limpid again. Then a little starch solution is added, and titrated with a tenth-normal solution of iodine until a dark blue color appears.

The quantity of iodine which was released at first must be equal to the 10 Cc. minus the number of cubic centimeters of thiosulphate solution. The presence of acid phosphates and organic acids does not interfere with the reaction, as they do not act unless in concentrations above what are encountered in the gastric juice. The iodine test here described indicates only the amount of free hydrochloric acid; the bound acid does not seem to share in the reaction. By adding merely a solution of some iodate and a little potassium iodide or sorium iodide to gastric juice, if iodine separates out, we can be confident that there is free hydrochloric acid present. (Reprinted from *The Journal of the American Medical Association.*)

THE CRYSTALLINE COMPOUND CONTAINING IODINE WHICH OCCURS IN THE THYROID.—E. C. Kendal has isolated a compound in crystalline form which contains 60 per cent. of iodine; its molecular weight is 586. Its constitution is not known, but it is neither diiodotyrosine, tetraiodohistidine, triiodoimidazol, iodized tryptophan nor iodized phenylalanine. In physiological action it is identical with thyroid tissue. (*Endocrinology,* 1, 153 (1917). *C. A.*, 11, 3314.)

MICROCHEMICAL REACTION FOR PERCHLORATES.—The reagents employed are (1) a 1:100 aqueous solution of strychnine sulphate; (2) a 1:50 solution of brucine in 1 per cent. acetic acid; and (3) a 1:50 aqueous solution suspected to contain perchlorate, which should be present as an alkali salt, is placed on a glass microslide so that it forms a deep convex spheroid and is not spread out over the surface. Into this is plunged the point of a finely drawn outglass stirrer, previously dipped in either of the above alkaloidal solutions. If a turbidity occurs almost at once, which happens when a moderate quantity of a perchlorate is present, the stirrer is withdrawn and the growth of crystals observed directly with low power without a coverglass; then afterwards, with a higher magnification under a cover. If no immediate turbidity is observed, the tip of the stirrer is brought down to the surface of the slide and stirred against the glass in concentric circles with gentle friction. In a short time, a turbidity will appear if perchlorates are present, and in a couple of minutes or so characteristic crystals may be seen under the microscope. With strychnine sulphate there will be group needles evident with a 1:1,000 solution of perchlorate. With brucine acetate a 2 to 3:1,000 solution of perchlorate is requisite to obtain characteristic lozenge-shaped crystals. With morphine hydrochloride a 1:500 perchlorate solution is necessary to show the stellate groups of morphine perchlorate. These reactions are the corollary of the author's micro reactions for alkaloids with sodium perchlorate reagent. (G. Deniges, *Annales Chim. Analyt.*, 1917, 22, 127, from *The Pharmaceutical Journal and Pharmacist.*)

Estimation of Silver in Organic Compounds.—The advantages of the cyanid-sulphide method are pointed out. 0.3 of the organic compound are dissolved in N/4 sodium cyanide solution, of which two or three drops are added in excess. The solution is warmed and, as soon as the solid has dissolved, 10 mils of N/1 sodium hydroxid solution are added, and the solution diluted to 300 mils. 25 mils of N/4 sodium sulphide solution in excess of the theoretical amount required for the precipitation of the silver are added slowly with stirring, and the solution heated to 60° C. and stirred until the precipitate has coagulated. The precipitate is then filtered off on a Gooch crucible, washed with water until free from soluble sulphide, then with alcohol and ether, and dried at 100° to 110° C. for half an hour. The excess of sodium sulphide mentioned makes certain the precipitation of all but 0.05 Mgrm. of silver. It is said by the authors of this paper that in a number of instances in which this method was used most excellent results were obtained. (*J. Amer. Chem. Soc.*, 1917, 39, 2074–2078, through *The Analyst*, Dec., 1917, page 400.)

J. K. T.

A Delicate Reaction for Hydrogen Peroxide.—It has been shown that tartaric acid in the presence of a ferrous salt added to hydrogen peroxide, and the addition of a caustic alkali, gives rise to the formation of a violet coloration, due to the production of a ferric compound of dioxytartaric acid. Investigation by Deniges revealed that while this reaction was unsatisfactory for the detection of tartaric acid, it was, under certain conditions, satisfactory for revealing quite minute traces of hydrogen peroxide. Experimentation showed that the following test could be relied on: Two mils of a 5 per cent. solution of tartaric acid and one or two drops of ferrous ammonium sulphate of the same strength are placed in a test-tube, and, after shaking, one or two drops of hydrogen peroxide are added; when the hydrogen peroxide is very much diluted, as much as two mils of it may be added. After agitation and making alkaline with sodium hydroxide, a violet coloration is formed in the presence of as little as 0.04 to 0.05 of a milligram of oyxgen. (*Ann. Chim. Anal.*, 1917, 22, 193, through *The Analyst*, Dec., 1917, page 403.)

J. K. T.

TEST FOR NITRATES.—This test is carried out by adding to the suspected nitrate a crystal of resorcinol and a little brucine, covering the whole with a few drops of concentrated sulphuric acid. In a few minutes a deep blue coloration develops around the crystal of resorcinol and gradually diffuses throughout the whole of the acid. On dilution with water the color disappears, but a greenish-blue precipitate is formed.

The above test is also a ready means of distinguishing a nitrate in the presence of bromides and iodides. Nitrites also respond to this test.

J. K. T.

COLORIMETRIC METHODS FOR THE ESTIMATION OF VERY SMALL QUANTITIES OF MORPHINE.

I. GEORGES AND GASCARD'S IODIC ACID METHOD.—The authors employ a modification of this method. Instead of using a Duboscq colorimeter, they prepare a scale of colors by diluting a faintly acid solution of morphine in about N/10-hydrochloric acid to a concentration of 1 in 1,000 and then prepare from this a series of solutions of concentrations down to 1 in 10,000. Equal volumes (10 Cc.) of these solutions are treated with 5 Cc. of 5 per cent. iodic acid solution, and the yellow colorations are examined after about half a minute. The differences in color are more pronounced in the more dilute solutions. Whilst morphine can be thus detected at a concentration of 1 in 12,500, quantitative observations can only be made at concentrations between 1 in 1,500 and 1 in 5,500. The method is rendered more sensitive if 1 Cc. of 10 per cent. aqueous ammonia is added about five minutes after the addition of the iodic acid. Morphine can thus be detected at a concentration of 1 in 18,500 and estimated at concentrations between 1 in 5,000 and 1 in 16,500.

II. ESTIMATION WITH MARQUIS'S REAGENT.—One Cc. of the morphine solutions prepared as above is evaporated in a small basin, the residue is treated with 1 Cc. of Marquis's reagent (2–3 drops of 40 per cent. formaldehyde solution, 3 Cc. of conc. sulphuric acid), and the violet solution is washed into the comparison tube with 4 Cc. of sulphuric acid. The colors are examined by transmitted light, since in reflected light an actual color change from blue to bluish-brown renders the comparison untrustworthy. Morphine can thus be estimated at concentrations between 1 in 1,400 and 1 in 14,000, and, the dilution with the sulphuric acid being omitted, can be detected at a concentration of 1 in 25,000.

Two samples of ripe poppy capsules examined by these methods were found to contain 0.017 and 0.068 per cent. of morphine respectively; in neither case did the seeds contain morphine. (From the *Journal of The Society of Chemical Industry*.)

DETERMINATION OF SHELLS IN COCOA.—A method for the detection of shells in cocoa is described by Wasicky and Wimmer (N. Nahr Genussm., 30, 25–7, 1915). This method is based upon the difference in appearance between shell and nib tissue when viewed through a microscope by ultra-violet light. The proper light is best obtained by means of a carbon-iron arc lamp, the light before reaching the mount being passed through a Wood-Lehman filter (two blue Uviol glass cells, one filled with 1 : 2,000 nitrosodimethylanaline, and the other with concentrated copper sulphate solution. The color of the shell tissues when seen by this light is buff or brown, the mucilage cells being almost colorless or a light yellowish green. The nib tissues appear in various shades of blue-violet. The details of the method are as follows: Treat ten milligrams of the powder with ten cubic centimeters of alcohol-glycerol mixture (equal parts of each) and allow to stand for one hour. Centrifuge, pour off the liquid layer and add one cubic centimeter of borax-glycerol solution (1 gram borax, 15 grams glycerol) to the solid residue. Mix thoroughly and place one drop upon a Hartwich-Wichmann counting cell. View through a microscope by means of ultra-violet light and count the number of shell particles visible over a given area. The per cent. of shells present can be ascertained by counting the shell particles in mounts of known composition prepared in the same way and comparing with the count of the unknown. The samples employed for comparison must have about the same degree of fineness. (From *The Chemical Engineer.*)

MEDICAL AND PHARMACEUTICAL.

PARAFFIN TREATMENT OF BURNS.—Various preparations of paraffin have been made under Hull's direction, containing acriflavine, brilliant green, chloramin-T, etc., dissolved in the paraffin base. These preparations have been given a very extensive trial. Another direction in which the new antiseptics have been given scope for improvements, has been the treatment of the burn by an antiseptic before the application of the paraffin. The results following this modification have been so satisfactory that Hull adopted it as a routine method. The method of application of the paraffin base is the same in all cases. The burn is first of all washed with physiologic sodium chloride solution or 1 in 1,000 acriflavine solution on gauze. A layer of paraffin is painted over the burn. The paraffin is applied at a temperature of about 55 to 60° C. A thin layer of wool is placed over the first layer of paraffin and a second layer of paraffin at the same temperature is painted over the wool. A dressing of wool and bandage is applied over the paraffin dressing. The dressing is changed every twenty-four hours. The addition of antiseptics to the paraffin preparation gave better results than preparations without antiseptics. The first antiseptic to be extensively used was eucalyptus oil, which, in conjunction with betanaphthol, is still used in No. 7 paraffin. Scarlet red paraffin has given satisfactory results in general use. It accelerates healing. Flavine paraffin has given satisfactory results. Paraffin preparations of brilliant green and chloramin-T have not been satisfactory from a pharmaceutical point of view, the antiseptics being difficult to incorporate in the paraffin.—From the *British Medical Journal,* reprinted from *The Journal of the American Medical Association.*

Chloramine Surgical Powder.—An absorbent, antiseptic, slightly astringent surgical powder may be prepared from the following formula, which is the advertised composition of "chlorazene powder," an American specialty:

Chloramine-T	1 per cent.
Zinc stearate	10 " "
Sodium stearate	89 " "

From *The Prescriber.*

Fifty Cases Treated by Flavine.—Since June, 1917, Bashford and his associates have investigated the clinical results of the application of flavine to war wounds. At the same time an attempt has been made to interpret these results with the help of histologic and bacteriologic methods. The flavine used has been for the most part "acriflavine" sent out by the Medical Research Committee, but latterly samples of proflavine from the same source were substituted. The results were substantially the same with both. On account of the experimental nature of the treatment, the cases were carefully arranged in a series of gradually increasing severity. The wounds, taken as a whole, were not of great gravity, and this fact was considered in estimating the value of the treatment. Almost all had been treated previously at the front by the Carrel-Dakin method within twenty-four hours of being wounded, and, in the majority of instances, very efficiently. No wounds involving the cavities of the head, chest, or abdomen were included. The patients reached the wards at periods varying from one to six days from the date of reception of the wound, and the flavine treatment was then substituted for that of Carrel-Dakin. It was carried on continuously until either the wound became ready for secondary suture, or until, after three weeks' treatment, it had definitely failed to attain the necessary standard for closure. In a few cases the treatment was stopped in the patient's interest before the three weeks had elapsed. Every attempt was made to eliminate the possibility of personal bias. In wounds treated by the Carrel-Dakin method it is the cocci which are usually the last to disappear from an infected wound surface. In those wounds treated by flavine the commonest type of organism to outlive others on the wound surface was a gram-negative bacillus.

This study showed, in brief, that a solution of 1 : 1,000, far from being innocuous, produces very deleterious effects on the entire process of healing, killing successive layers of the reacting tissue element, including the essential vascular mechanism. The flavine treatment of wounds is associated with small formation of pus, slow epithelial ingrowth, delay in all the processes of repair, lingering of organisms on the wound surface, some diminution in the local and general reaction to infection. The only favorable feature has been that the patient is apparently protected in some way from the absorption of toxic products. Whether this is due to the disturbance of vascularity or to flavine rendering toxic products nontoxic has not been determined. The authors are convinced that the employment of flavine and other dyes as if they supplied royal roads to success must be regarded as retrograde steps.—(E. F. Bashford, J. N. J. Hartley and J. T. Morrison.—*British Medical Journal,* London, reprinted from *The Journal of the American Medical Association.*)

SOLVENT ACTION OF ANTISEPTICS.—As the erosive action of Dakin's solution is an important factor, experiments were conducted by Taylor and Austin to compare its solvent action with that of certain other chlorinated antiseptics. The solvent action of the various substances employed was tested by adding 50 Cc. of each solution to 5 Cc. of an emulsion of macerated liver tissue to a 100 Cc. bottle. Chloramin-T solutions, hypochlorite solutions, chlorinated oils and dichloramin-T were tested. From the results obtained by the authors considerable stress is laid on the relatively great solvent action of Dakin's hypochlorite solution as contrasted with the more recent and more stable chloramins of Dakin. It also seems probable that to its greater ability to dissolve necrotic tissue, plasma clot, and leukocytes it owes its chief claim to preference over the chloramins in the treatment of infected wounds. The results also show that the solvent action of Dakin's hypochlorite solution in the degree of alkalinity used clinically is due primarily to its hypochlorite content. The slight alkalinity of Dakin's solution, while in itself without solvent action, does, however, increase the effectiveness of the hypochlorite. Chloramin-T failed in these experiments to exhibit any solvent action not explicable as an effect of the alkalinity of the solution in which it was dissolved, and dichloramin-T was wholly without solvent action. The results of these experimental studies do not, therefore, support the clinical observations of Dakin and his associates, who assert that the chlorine in dichloramin-T, as in the hypochlorites, has the power of dissolving dead tissues. In the degree of alkalinity used clinically, the solvent action of hypochlorite is absent below about 0.2 per cent. sodium hypochlorite concentration. None of the antiseptics studied had demonstrable solvent action on blood clot.—(*Journal of Experimental Medicine*, Baltimore, reprinted from *The Journal of the American Medical Association.*)

Test of Digesting Power of Gastric Juice.—Ramond adds 5 Cc. of filtered gastric juice to 5 Cc. of a 3 per cent. solution of gelatin in a test tube at room temperature. Tubes 15 Mm. in diameter seem best adapted for the purpose. The gelatin is sterilized at a temperature not surpassing 100° C., and the tube should be kept strictly vertical. He usually adds 2 Cg. of thymol on top of the gastric juice. A ring forms in the gelatin below the surface and makes its way downward. This is the work of the acid in the gastric juice. At the same time the surface of the gelatin grows lower and lower, but much more slowly. The progress of this digesting away of the gelatin can be watched by a graduated scale on the tube or a paper behind it. The digestion proceeds normally about 2.5 Mm. in twenty-four hours. Several tubes are used for each gastric juice. The test is a simple and practical method of determining the digesting power and the acidity of a given gastric juice.—(*Bulletin de la Societe Medicale des Hopitaux de Paris,* reprinted from *The Journal of the American Medical Association.*)

Antagonism Between Atropine and Physostigmine.—The conclusions from 225 tests made at the pharmacology institute of the University of Utrecht are that a given amount of atropine is able to neutralize the action of physostigmine in the proportions of 1 to 1,500 up to 1 to 1,500,000. From *Nederlandsch Tijdschrift voor Geneeskunde, Amsterdam,* by G. den Besten and A. Sluyters—p. 1137, reprinted from *The Journal of the American Medical Association.*

COMMERCIAL AND TRADE INTEREST.

Patent Medicine Situation.—Street reviews the operation of the Federal Food and Drugs Act and the Sherley amendment and directs attention to the requirements drawn up by the National

Vigilance Committee of the Associated Advertising Clubs of the World. In brief, these are as follows: (1) The medicine must be appropriate for the particular affection for which it is recommended and must not affect unfavorably the course of the disease. (2) The remedy must not be named or advertised in a way to conceal its proprietary character. (3) The remedy should be offered through the regular wholesale or retail channels of trade, and not directly to the purchaser from the manufacturer. (4) If the preparation contains alcohol, it must be sufficiently medicated to prevent its use as an alcoholic beverage, and the proportion of alcohol should be no greater than that needed to hold permanently in solution the essential active ingredients of the preparation. (5) If the preparation is one which may occasion injury through misuse, proper warning against such use must be given on the label. (8) The preparation must not be intended for use as an abortifacient nor for any other immoral or illegal purpose, nor must it be advertised directly or indirectly for such a purpose. (9) The preparation must not be advertised or recommended, directly or by inference, as a cure for the diseases or conditions generally recognized as incurable by the simple administration of drugs, or for the cure of contagious diseases or those sufficiently acute to require skilled treatment. (10) The preparation must be in strict conformance with the Sherley Amendment. (11) Advertising not accompanying the package shall conform substantially to the statements on the label, carton or accompanying circular as to origin, composition, character and curative value.—(J. P. Street, New Haven, Conn.—From *Current Medical Literature,* reprinted from *The Journal of the American Medical Association.*)

MUSTARD-SEED PRODUCTION IN RUSSIA.—An increased demand for mustard-seed oil has resulted in a 25 per cent. increase in the acreage under mustard seed in Russia in the current agricultural year. The first statistics on this crop were gathered in a special census in 1916 and showed an acreage of 39,588 dessiatines (106,876 acres). In 1917, 133,700 acres were under cultivation. As the average yield of mustard seed per dessiatine is 50 poods (approximately 1,800 pounds), the production in 1916 was about 35,700 tons and in 1917 about 44,700 tons.

It is difficult to give an exact figure for the amounts of mustard seed exported from Russia because in the customs reports the seed is included under the heading "other oil seeds." In 1915, 251.4 tons of seeds under this general heading were exported from Russia, and in 1916, 631 tons. According to the general data available, about 40 per cent. of the seed under this heading is mustard seed, giving an export figure for 1915 of about 100 tons and for 1916 of 252 tons. As the exports of mustard seed are not listed as such, it is impossible to list the ports of export or the destinations of the shipments.

About 70 per cent. of the crop of mustard seed is taken for mustard-seed oil production; about 10 per cent. goes for the production of ethereal oil; 19 per cent. is used in the manufacture of mustard (*Farina sinapis*); and the remaining 1 per cent. is sold by pharmacists under the name of mustard seed (*Semina sinapis*). (From *Commerce Reports.*)

JAPAN PEPPERMINT CULTIVATION.—We hear, says the *Monthly Trade Journal,* that steps will soon be taken at Hokkaido, where the chief peppermint cultivation of Japan is carried on, to systematize the cultivation of the planting and the manufacture of menthol. In the past, the sun-drying process especially has left much to be desired and, while the peppermint in the shape of crude oil has so far been shipped to Yokohama and Kobe, where it is distilled in the factories, it is now proposed to erect factories in the chief farming districts on a coöperative basis.

Peppermint oil derived from the residue of oil after being properly refined is finding every year a larger demand abroad. Before the war the largest customer of Japanese menthol crystal was Germany, while to-day America is taking at least 88 per cent. of the total output. The average price has been between $1 and $1.50 per lb., while several factories at the end of 1916 sent circulars to their chief customers announcing that, owing to circumstances, prices were likely to go up during 1917. This did not happen owing to improved factory conditions. During 1916 about 525,000 lbs., valued at $1,031,250, were produced. (From *The Journal of Industrial and Engineering Chemistry.*)

GUTTA-PERCHA FROM THE SHEA BUTTER TREE.—A supplement to the official *Nigeria Gazette* publishes a note to the effect that a trade in what is known locally as gutta-percha—a substance prepared from the latex of the Shea butter tree—has sprung up during the last two years in the province of Bornu. The method of collecting and preparing the product is given as follows: Small pieces of the bark are chipped out of the tree with a narrow native axe. The latex that slowly exudes from these cuts is scraped off, as it contains impurities such as dirt, bark, etc. It is then boiled until the impurities float to the top when they are removed. The latex then coagulates and in this form is known as gutta-percha. It is not advisable to tap trees of less girth than 30 inches. The Shea butter tree is abundant in many parts of the Northern Provinces, and especially so in Meko, Shaki and Oyo districts of the Southern Provinces and in Ilorin. When collecting this product, the tappers could with advantage collect the Shea nuts and thus help to stimulate the trade in Shea butter. (From *The Journal of Industrial and Engineering Chemistry*.)

CARDAMOM PRODUCTION IN SOUTH INDIA.—The American consulate at Madras has received a letter from the Director of Industries and Commerce at Bangalore, Mysore, stating that considerable quantities of cardamom seed were formerly exported from the Mysore State, but that because of the stoppage of export for the past two years the trade is almost at a standstill. The Director, therefore, requests to be informed if arrangements can be made for shipping about 2,000 tons of seeds to America, and if it is not possible to find space to ship a large quantity of seeds he desires to know the names of any firms in the United States which might be interested in purchasing cardamom oil or who are wholesale dealers in same. He states that he is prepared to offer samples of seeds or of oil and to quote prices f. o. b. Bombay or Madras. It is suggested that any firm interested should write direct to the Director of Industries, Mysore State, India. (From *Commerce Reports*.)

BOOK REVIEWS.

THE ACTION OF DRUGS.—A course of Elementary Lectures for Students of Pharmacy, by Torald Sollman, M.D., Professor of Pharmacology and Materia Medica in the School of Medicine of Western Reserve University, Cleveland, Ohio. Published by W. B. Saunders Company, Philadelphia.

Some idea of the character of the book can be obtained from the author's preface. In speaking of the scope of the lectures, he refers to the long course of study necessary to enable a physician to prescribe intelligently, and says: "Any one who undertakes to treat disease with a lesser preparation faces serious legal complications, and even more grave moral responsibilities. . . . Indeed it would be far better for the public, and even for the pharmacist himself, that the pharmacist should be entirely ignorant of medical actions, than that he should become possessed of the dangerous conceit that he is competent to advise or prescribe. "As a professional man, he can coöperate with the prescribing physician much better, if he has an intelligent understanding of the broad principles which guide treatment, of the objects which are to be accomplished, and of the means that are utilized. The pharmacist himself will be protected against many blunders in the exercise of his higher professional function, the compounding of prescriptions. He will be able to protect the public against the errors of others, as well as his own. He may by the exercise of tact put the physician under lasting obligations."

The arrangement of part of the book seems quite peculiar; following Corrosive Poisons, we have Astringents and then Antiseptics and Disinfectants. Following Uterine Drugs and Antispasmodics, we have Tonics, Alteratives and Expectorants, etc. To an outsider there does not seem to be a logical sequence in this arrangement, although some other chapters follow each other naturally.

The different articles treated of are handled in an intelligent and extremely interesting manner which makes the book good reading. The articles are at times extremely brief and unless the student has more basic knowledge than most pharmaceutical students have, will call for considerable explanation.

Dr. Sollman is quite a nihilist regarding the value of many drugs. Of phosphorus he says: "To administer the ordinary dose of phosphorus with the idea of nourishing nerve tissue has about as much sense as to take water in five-drop doses with a similar object, for nerve tissue contains considerable more water than it does phosphorus." Of camphor, "internally it is said to be a sort of popular cure-all. As used by the laity, its effects are probably imaginary." Of mineral waters he says: "Most if not all of the natural mineral waters are marketed under exaggerated or even fraudulent claims, at least as to activity. Lithia water is a flagrant example. Government investigation has shown that the most popular lithium water contains no more lithium than does the water of the Potomac river, and that one could not get an effective dose of lithium by drowning himself in the water. Such waters are of course absolute frauds."

Of the digestants it is said: "The various compound digestive elixirs are devoid of digestive action." Of the uterine sedatives he says: "They are largely sold in the form of 'patent medicines' for 'female weakness'; but it is very doubtful whether they have any action beyond the pyschic effect of the contained alcohol."

Of tobacco it is said: "More serious is the occasional occurrence of blindness in inveterate excessive smokers." This statement of Dr. Sollman many smokers will consider an exaggeration, but we can verify it from our own knowledge. He emphasizes the value of 10 per cent. solutions of alcohol in phenol poisoning, afterwards washing out the stomach. "Of chemical antidotes only syrup of lime and potassium permanganate are of any value."

In speaking of headache powders containing acetanilide or acetphenetidin, "the danger lies in repeating the dose at short intervals; the adjuvants caffeine, ammonium carbonate, sodium carbonate do not diminish the danger."

Of liquid petrolatum he says: "The Russian is no better than the American." In the physiological testing of ergot, Dr. Sollman considers the cocks-comb method as preferable to the bood-pressure or uterine methods. Many more interesting excerpts might be quoted from this work.

C. B. Lowe, M.D.

MERULIUS IN NORTH AMERICA.

In *Annals of the Missouri Botanical Garden,* vol. xv, no. 4, for November, 1917, Edward A. Burt describes 42 species of the genus *Merulius* that are found in North America. Thirty-nine figures, for the most part of spores, accompany the descriptions, while 3 plates comprising 36 figures supplement the article. A key to the identification of the species is also given.

In surveying this excellent monograph one is delightfully impressed with the care observed by the writer in employing technical color terms found in conjunction with color plates in a standard work on colors. Too frequently otherwise valuable contributions to the literature of art and science are impaired by inexactness on the part of the contributor in expressing the various color shades. Since there exist a number of works on color, each differing in extent and character of nomenclature, it is often difficult for one to decide upon the work to be followed. There should be little hesitancy, however, upon selecting for comparison and citation some one good color reference, for it permits the reader to find the exact color shade which the writer desires to impart to the character presented.

The species of *Merulius* are of great economic importance on account of the dry rot of timber produced by those which grow on wood. Since very little has been published in the United States concerning decay caused by many of our common species, this monograph, giving the names and descriptions of the species and the kinds of woods attacked by each, will doubtless prove extremely valuable alike to the mycologist, plant pathologist and those interested in the lumber industry.

HEBER W. YOUNGKEN.

TWO EXOTIC COMPOSITÆ IN NORTH AMERICA.

J. M. Greenman in *Annals of the Missouri Botanical Garden* for November, 1917, mentions and redescribes two foreign species, *Senecio canabinæfolius* Hook. & Arn. and *Erechtites arguta* DC., which have taken foothold on North American soil.

The first of these, *Senecio canabinæfolius,* was found on ballast at Hunter's Wharf, presumably at Pensacola, Florida, by Professor Charles Mohr early in the nineties, who referred to it as *Senecio* without indicating the species. Upon comparison this specimen as well as another in the National Herbarium at Washington with Hooker and Arnott's original description of *Senecio canabinæfolius,* a South American species growing near Buenos Aires, the writer concludes they agree in every detail. He describes the plant as follows: "A stout herb, glabrous throughout, or slightly white-tomentose on the under leaf surface; stem erect, 1 to 1.5 m high, branched, striate; leaves 3 to 10 cm. long, mostly deeply bi–tri-pinnatifid with few linear to linear-lanceolate divergent sharply dentate lateral divisions; inflorescence a terminal compound corymbose many-headed cyme; heads about 1 cm. high, radiate;

involucre campanulate, calyculate; bracts of the involucre linear-attenuate, 5 to 6 mm. long; ray-flowers 9 to 13, rays yellow; disk-flowers numerous, about 50; achenes hispidulous.—Florida: on ballast ground, Hunter's Wharf, Pensa cola."

The second, *Erechtites arguta* DC., is a pernicious weed indigenous to Australia and New Zealand which has recently appeared on the Pacific coast. Alike with the common "fireweed," *Erechtites hieracifolia,* which has become widespread throughout North America, it is possible that it too may eventually become widely distributed at least in the western portion of this country. The writer cites the following characteristics of this species: "A coarse herb: stems erect, 3 to 10 dm. high, leafy, striate, slightly floccose-tomentulose; leaves oblanceolate to lanceolate, 3 to 12 cm. long, .5 to 2.5 cm. broad, pinnately lobed to runcinate-pinnatifid, sharply and unequally dentate, at first arachnoid-tomentulose above, densely and more or less persistently white-tomentulose beneath; the lowermost leaves narrowed into a petiole; the main stem-leaves sessile and semi-amplexicaul; inflorescence a terminal many-headed corymbose cyme; heads small, 5 to 7 mm. high; involucre calyculate and tomentulose at the base, nearly or quite glabrous above: bracts of the involucre about 13, occasionally becoming dark brown or almost black in the dried state.—California: near Mendocino."

According to the writer it is most probable that this species has been introduced in connection with the extensive lumber trade between California, Australia and New Zealand since collections of it have been made in the vicinity of lumber camps.

HEBER W. YOUNGKEN.

ESSENTIALS OF VOLUMETRIC ANALYSIS. An introduction to the subject, adapted to the needs of Students of Pharmaceutical Chemistry. By Henry W. Schimpf, Ph.G., M.D., Professor of Analytical Chemistry in the Brooklyn College of Pharmacy. Third Edition, rewritten. xiii + 366 pages, 5¼ by 8. 61 figures. Cloth, $1.60 net. John Wiley and Sons, Inc., New York.

In the preface to the First Edition the author states that his "aim is to present the principles of this interesting and important subject in a form readily intelligible to students, and available for lecture-room and laboratory work," an object which he seems to have realized very fully in the present edition. The subject matter is systematically arranged and treated concisely, yet with such a clarity of expression as to make it easy for the student to comprehend.

The first seven chapters of Part I deal with the general chemical principles underlying volumetric analysis, the significance and use of standard solutions, indicators and the ionic theories regarding their action, description of volumetric apparatus and its uses, together with methods for calculating results of analyses. The remaining three chapters treat, respectively, of analysis by neutralization, by precipitation, and by oxidation and reduction. In addition to working directions for the preparation of the necessary solutions, both of reagents and the substances to be analyzed, each of these chapters gives special directions for the analysis of a large number of individual substances, together with much other information, much of it arranged in tabular form.

Part II, comprising seven chapters, treats of the estimation of alkaloids, phenolic substances, sugars, formaldehyde, alcohol in alcoholic liquids, as well as of assay methods for vegetable drugs and their preparations, and technical methods for analyzing fats, oils and waxes.

Part III, comprising five chapters, treats of the gasometric analysis of nitrites, nitrates, hydrogen dioxide, insoluble carbonates, and urea (in urine).

An Appendix describes, more or less briefly, nineteen substances commonly used as indicators in analysis by neutralization, giving, in each case, the source, color in acid and alkaline solution, uses, limitations, and strength of solution ordinarily used.

The subject matter of the book, so far as it deals with official substances, is in conformity with that of the U. S. P., IX, and the term "mil" replaces the term "c.c." of previous editions.

Though primarily intended for the use of students in schools of pharmacy, the volume is one which is well worth a prominent place in the laboratory library of the pharmacist, or anyone else, who does anything at all in the way of quantitative analysis.

F. P. STROUP.

A CRITICAL REVISION OF THE GENUS EUCALYPTUS. By J. H. Maiden, I.S.O., F.R.S., F.L.S., Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney. Vol. IV, Parts 2 and 3. Published by authority of the government of the state of New South Wales. The appearance of these two additional parts to this extensive study of the Eucalypti carries on this masterpiece of monographic study, which we have reviewed from time to time as the parts were published.

Part 2 of Vol. IV describes *E. Seeana* Maiden; *E. exserta* F.v.M.; *E. Parramattensis* C. Hall; *E. Blakelyi* n. sp.; *E. dealbata* A. Cun.; *E. Morrisii* R. T. Baker; *E. Howittiana* F.v.M.; with excellent plates exhibiting the characteristics of the leaves, flowers and fruit which are the most important botanical points for distinguishing the species.

Part 3 of this volume similarly considers and illustrates the following species: *E. rostrata* Schlechtendal; *E. rudis* Endlicher; *E. Dundasi* Maiden; *E. pachloma* Benth.

The style of treatment of the subjects under consideration is the same as in the preceding parts, ample consideration being given to description, affinities, uses, literature, etc.

With the parts now before us this valuable contribution completes the critical study of 171 species of the genus *Eucalyptus*.

G. M. B.

NEWS ITEMS AND PERSONAL NOTICES.

First Potash Permit.—Under a recent act, the Secretary of the Interior is authorized to issue permits for the exploration for potash. Each permit is to cover a tract of not more than 2,500 acres and to run for two years. If the exploration demonstrates the presence of potash in satisfactory quantity and quality, a license for one quarter of the land will be given to the person having the permit. Under this law, Secretary Lane has issued the first permit covering a tract of about 2,500 acres of alkaline marsh land in Inyo County, California, and exploring wells will be promptly sunk.

The American Fairchild Scholarship.—The first award of this scholarship has been made to Daniel Kollen, of New York City. The recipient was born in the city of Kishinef, Bessarabia, Russia, August 27, 1898. His father died when he was about eight years of age and in 1910 his family emigrated to the United States.

His preliminary education was obtained in the Russian schools for about three years and continued in the public schools of New York, where he was graduated from the DeWitt Clinton High School in 1917. He has been employed in the drug store of his uncle in New York City. He has matriculated at the Brooklyn College of Pharmacy.

Henry S. Wellcome Presents a Motor Bacteriological Laboratory to the British Army Medical Department.—Mr. Henry S. Wellcome, who acquired his pharmaceutical education in the Philadelphia College of Pharmacy and who is well known as a member of the firm of Burroughs Wellcome & Co., London, and as the founder of The Wellcome Bureau of Scientific Research, recently presented to the British War Office a completely equipped motor bacteriological laboratory for service in the Army Medical Department.

The body of the car and its weatherproof extended annex form a total working space of 219 square feet. A complete bacteriological equipment is supplied in thirteen strongly made canteens, so arranged that the contents are easily accessible, but securely safeguarded against damage in transit and difficult conditions of transport. The equipment contains the necessary tables, incubators, microscopes, balances, autoclave, centrifuge, etc., and a water tank fitted with a suitable pump is erected on the roof of the car.

In addition to the apparatus named, the equipment includes hot chambers, Pasteur oven, microtome, ice chest for water samples, a complete electric lighting outfit and arrangement for animal cages. The arrangement for the numerous accessories has been ingeniously worked out so that everything is grouped and readily accessible.

The annex and the complete bacteriological outfit are so arranged that they can be readily assembled and securely packed on the accompanying three-ton chassis. The entire outfit can be assembled and packed for transport in about two hours.

Dr. Whelpley Completes Thirty Years of Editorial Work.—With the issue of the special January number of Meyer Brothers' *Druggist,* Dr. Henry M. Whelpley rounds out thirty years as the editor. It is always an inspiration to note the many activities of Dr. Whelpley and how systematically and successfully he performs each responsibility. It is our privilege, as well as an esteemed pleasure, to extend on this occasion our sincere congratulations and best wishes to this editorial friend, who in addition fills so many other important duties in the pharmaceutic and scientific organizations and performs each with marked ability.

Dr. C. T. P. Fennel now Professor of Materia Medica.—Dr. Charles T. P. Fennel, for fifteen years a state chemist of Ohio and later professor of chemistry in the Cincinnati College of Pharmacy, has been elected to the chair of materia medica at the University of Cincinnati, made vacant by the decease of Dr. Julius Eichberg.

Hearing on the Edmonds Bill.—Hon S. Hubert Dent, Jr., Chairman of the Military Committee of the House of Representatives, has appointed Tuesday, March 19, 10.30 A.M., as the time for the Committee to hold a hearing on H.R. 5531, the bill introduced by Congressman George W. Edmonds to establish a Pharmaceutical Corps in the Army.

Pharmacy Students Called to the Colors.—Each month we note the call of more of the students of the Philadelphia College of Pharmacy to their country's service. Since the Christmas holidays over twenty members of the pharmacy classes have been called to serve in the army. At the last report the number of students and graduates of the P. C. P. in last year's classes, enlisted in the military and naval service had passed beyond the two hundred mark.

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EDITORIAL.

The Progress of Prerequisite Legislation.

During the past winter, two of the legislatures in session have passed educational prerequisite amendments to their pharmacy laws. As usual, these laws were enacted through the efforts of the state pharmaceutical associations. The pharmacists of Virginia and of New Jersey are to be congratulated upon this achievement in behalf of the professional elevation of pharmacy.

New Jersey lays claim to having been the first state in which the druggists formed a permanent state organization for the betterment of the conditions in their calling. As early as 1895, through the efforts of this state association a pharmacy law was enacted providing for the appointment of a Board of Pharmacy to examine and license pharmacists and assistant pharmacists. This was further improved by an amendment passed in 1901.

In 1905, a movement was started to have New Jersey follow the example of her neighboring states in requiring that registered pharmacists must be graduates of reputable schools of pharmacy. The pharmacists of the state had first to be educated to this step, so necessary for professional advancement, and so it was not until 1911 that the New Jersey Pharmaceutical Association approved a draft of a bill for an amendment to the pharmacy act of 1901 the most important provision of which was a section requiring prerequisite education and graduation from a school of pharmacy for the licensed pharmacists.

Since 1912, the legislature of New Jersey has been continuously appealed to for such an amendment to the pharmacy practice act. The Assembly readily responded and on several occasions passed the pharmacists' bill, but the Senate was obdurate and adverse interests "pigeon-holed" the bill in committee. In 1916, the Committee on Legislation of the State Pharmaceutical Association had the prerequisite amendment introduced first in the Senate and were successful in passing the bill almost unanimously through both houses, but their victory became a defeat when the Governor withheld his approval because it deviated from a policy that he had announced; one of the principal reasons he assigned was the provision for a per diem of $10.00 to each member of the board for services performed for the board.

This year, the committee reframed the bill so that it covered but little more than the desired qualifications for the personnel of the Board of Pharmacy and the educational requirements for applicants for registration as pharmacists or as assistant pharmacists. The bill was favorably acted on by the legislature and was promptly signed by the Governor. The Act provides that every person applying for registration as a pharmacist "shall have been duly graduated from a school of pharmacy complying with the rules and regulations of 'The Board of Pharmacy of the State of New Jersey,' and shall present to the board a certificate from the Commissioner of Education of this State showing that such applicant, before entering the school of pharmacy, had obtained an education equivalent to the standard established by the Board of Pharmacy of the State of New Jersey." Thus leaving to the discretion of the board, the standard of preliminary education to be required and such advancement thereof as, from time to time, they deem wise.

This review of the campaign of education that was necessary to secure needed legislation for the advancement of professional pharmacy in a state that was among the first to enact a pharmacy practice act, is given for the purpose of illustrating the necessity for persistence in the efforts of pharmacists in such matters. It further demonstrates the proverbial slowness of reforms. At least a quarter of a century has passed since the leaders in pharmaceutical education commenced their agitation that students in pharmacy should be required to have sufficient preliminary education to grasp the college studies and that a collegiate education in the sciences associated with the practice of the art of the apothecary should be required by the law of each state. After the lapse of all of these years, we can only state that, with the accessions of this year, eleven or twelve states have adopted laws to that effect. In most of the states no such legal enactment has as yet been considered and in some of the states that are supporting state universities with pharmacy departments, the door to the practice of pharmacy has been left wide open through its pharmacy law, by permitting the registration of pharmacists without any collegiate education.

Before pharmacy can claim the general recognition as a profession that is so greatly desired, its followers must be professionally educated and the nation-wide adoption of a requirement that every licensed pharmacist must be a graduate of a school of pharmacy is an initial step that is essential for the professional elevation of pharmacy. The stigma of three fourths of our states without such prerequisite laws must be wiped out.

This duty will undoubtedly devolve upon pharmacists themselves and should claim the immediate and persistent attention of every thoughtful person associated with the calling either as a teacher, writer, or practical druggist. Something more than resolutions is needed. A year of active, energetic effort on this movement will accomplish more for the real benefit of pharmacy than a century spent in resoluting. This is an opportunity that the American Pharmaceutical Association has had for years of performing a really great service in the line of its professed work in behalf of the betterment of pharmacy and a duty that it should forthwith enter upon with an active committee of its most capable members. When the educational qualifications of pharmacists are once established, then the objections in official and medical circles to the recognition of pharmacists as professional gentlemen must fall and many of the reforms that we are so strenuously advocating, such as the establishing of a pharmaceutical corps in the Army and Navy, will be more readily attained. As pharmacists it behooves us to appreciate fully the importance of nation-wide prerequisite legislation for pharmacy.

G. M. B.

CONSISTENT CONSERVATION OF DRUGS.

From the very beginning of the war, in the summer of 1914, the drug and chemical markets have been in an unsettled condition and, at times, the conditions regarding certain important commodities included in these classifications could be termed as chaotic. The closing of the usual sources of supply, the demands of foreign countries that prior to this had not looked to America for such supplies, the shortage of labor, the increased cost of production and the uncertainty of transportation were economic problems that the experienced merchant could calculate against but the influence of the enormous speculation engendered by the war made it difficult for conservative business men and the manufacturers to study the market fluctuations and to control the effect of these on their merchandise.

The enormous demand for chemicals for home consumption and for export has been met with the usual American energy. The ability shown, the capital invested and the progress already made demonstrate that many of the chemical industries have been so firmly established that, after this war, under normal trade conditions, we will in these be independent of foreign producers.

The same cannot, however, be said of drugs of vegetable origin and the chemicals derived from such. Here too frequently other problems than the need for energy and capital intervene. Very few plants thrive indiscriminately; most require special soil and climatic conditions. While the cultivation of a few of the continuously scarce and high-priced drugs may be made profitable as industries, those who have given careful study to the subject and, some who from war necessity are now engaged in medicinal plant cultivation, are convinced that in normal times the cost of cultivation with the economic conditions existing in this country will preclude the possibility of successful competition with plants growing naturally or by cultivation in foreign countries where the cost of collection is minimized by the utilization of a class of labor that we do not have in this country. However, we can accomplish much more than has so far been done by continuous scientific study of the possibilities of finding soil, climatic conditions and labor suitable to the needs of the individual plants and moreover the systematic development of methods for the collection and utilization of the vast stores of indigenous and escaped medicinal plants already growing in the United States. This is a much needed field of study for conservation of national resources.

In order to conserve the Nation's resources of both men and materials, Congress by the enactment of " war measures " has placed under executive control all supplies of foods, fuels and other essentials for the national security and defense, as well as transportation and other public utilities. It becomes the duty of every patriotic citizen to uphold the administration and to coöperate in this important work of conservation in every practicable way. It is doubtful if the majority of the inhabitants of the United States are yet fully alive to the gravity of the situation and the necessity for intensified energy along every line and for consistent conservation of all of our resources.

From the very beginning of the war, the thoughtful reader was impressed by the efforts being put forth by the European nations engaged in warfare to conserve their medical supplies. Especially in the pharmaceutical literature of the central powers, then available, was noted the frequency with which the word "ersatz" was used and the numerous substitutes suggested for drugs and vehicles commonly used for medicines. In Great Britain the need for conserving certain food products and war materials, was considered of sufficient importance to justify the modification of a number of formulas of the British Pharmacopœia, and the suspension of others.

The importance of providing ample supplies of medicines for the needs alike of the government forces and for the civilian population seems to have been largely overlooked. Despite the publicity given to the growing scarcity and enormous advances in the prices of some of the most important medicaments, the national authorities have not made any survey of the needs of the nation for medicines nor of the available supplies in the country. Surveys of fuel, foods, metals, certain chemical products and agricultural needs, etc., have from time to time been made. The schedule of food products accompanying the queries submitted to dealers in these commodities covered more than 100 different foods and presumably the information gained was, at least in part, the basis for the food conservation promulgations.

That a real shortage in many drugs already exists is apparent and this is prone to become more pronounced as the war continues. Competent members of the drug trade should be empowered at once to make a thorough investigation of the medicinal needs of the nation, the supplies in hand and to advise the administration as to the best methods of conserving supplies and obtaining additional or what alternatives may be possible for some articles that may be no longer procurable.

Following the example of the English pharmacists, several communications have appeared in the pharmaceutical journals advocating substitutes for alcohol, glycerin and sugar directed as solvents and vehicles in formulas of the U. S. Pharmacopœia and the National Formulary. While appreciating the spirit actuating the propositions, we cannot believe that the conditions in the United States either now or in the future are likely to be comparable with those existing in England regardng the substances named. The amount of alcohol, glycerin and sugar used in medicines is but a very small portion of that produced and this bears but a small ratio in comparison with the amount consumed in other industries of far less importance to human welfare. Consequently, based upon relative importance, the formulas of the official preparations should be altered only for improvements or in case of such absolute necessity for conserving the basic solvents as we trust never will exist.

The formulas of the U. S. P. and the N. F. are based upon many experiments and in some cases tests of therapeutic activity and permanency of preparation extending over years and before advocating changes in these we should be very certain that the alternatives proposed will yield not preparations appearing similar in viscosity, color or taste but that these will be of equal stability and therapeutic activity. The reduction of the amount of alcohol below what has been determined by such careful experimentation as necessary for exhaustion of a drug or the preservation of its preparations will result in less stable and efficient products. The substitution of diluted commercial glucose for syrup made from cane sugar is likewise questionable as the proneness of glucose solutions to undergo fermentation is well unkown and moreover it is doubtful if such a change would prove to be acceptable to consumers or any real economy at the present value of starch and materials made therefrom. There can be no economy in unstable formulas with the attending waste and danger of contamination.

We are impressed with the fact that many of the suggestions made *have not been tried out practically and appear to be largely academic.* Wherein is the economy in using "powdered glucose" or "saccharin" in place of sugar? Consistent conservation must consider the possibility of obtaining the substitute as a generally distributed article of merchandise and that its use would be a real economy.

We are not prepared to believe that tragacanth paste or irish moss jelly flavored by the addition of chloroform are acceptable substitutes for the official syrup nor that such alternatives will appeal to the users as proper bases for syrup of hydriodic acid and other official syrups for which these have been suggested. We voice our opinion as opposed to pharmacopœial camouflage.

Another serious objection to many of the suggested "war formulas" is that they offer very broad hints and methods of adulteration which may be continued by the unscrupulous in times of peace. The standards of quality and purity laid down in our official authorities should not be lightly dealt with nor should the bars of the pure drug laws be unnecessarily let down.

A very proper way to effect a sane conservation would be for the physicians wherever possible to simplify their prescriptions. Instead of prescribing fluid extracts of buchu, cascara, sagrada, senna, digitalis, etc., direct infusions of such drugs as those that yield their constituents to water. Vinegar of squill in diminished quantity could replace the syrup and at times solution of iron chloride in place of the tincture and very frequently syrup could with advantage take the place of glycerin and an aromatic water replace an elixir; or one of the weaker alcoholic basic elixirs like almond or vanilla elixir be prescribed in place of the more alcoholic and expensive aromatic elixir. The examples of simplified prescribing, which would lead to consistent conservation without the sacrifice of therapeutic action, could be multiplied many times over and this moreover is a plan in which medicine and pharmacy could work together in a common cause.

G. M. B.

THE SIGNIFICANCE OF MILITARY RANK.

Rank in the Army and Navy means authority, and authority properly controlled means efficiency. The conferring of military rank upon medical men in the Army and Navy, as proposed by the Owen bill, is vitally necessary for the health and life of the men in the service. Not that physicians will not do their full duty without such rank, but with such distinction they can command sufficient authority to do better work.

Why should rank be granted to other than military officers? After the hideous experiences of former wars and the exigencies arising in military operations in which the welfare of the personnel was not only often jeopardized but sacrificed, the medical arm of the service asserted its rights. A struggle arose to secure rank for surgeons on a parity with that of the fighting arm. Finally this was achieved in part, yet grudgingly, and, as yet, inadequately. Now, in all the armies and navies of European and Asiatic nations of the first class, the medical officer is clothed with authority parallel with that of officers in command of armies and ships. Immediately and automatically betterments thereupon arose in the conservation of health and efficiency. Why was this achievement of rank so absolutely essential a measure? This query could be best answered by citing numberless gruesome episodes oftentimes involving wasteful destruction of man-power caused by entirely preventable scourges, occurring in recent wars.

These obstructions to medical precautions, serious enough in themselves, were often aggravated by the intolerable and despotic arrogance of certain blindly prejudiced commanding officers. Space forbids narration of instances but any one old enough can recall the humiliating circumstances occurring in the Spanish-American War of 1898. There holocausts followed successful blocking of the best efforts of surgeons to enforce precautionary agents, e. g., in typhoid fever. Due to these nullifications of medical authority, thousands died and other thousands were invalided for life by a readily preventable disease, whereas only hundreds died of wounds or injuries in battle. Now this old struggle, apparently ended, breaks out again, while striving to render our life-saving and health measures more nearly perfect. Is human life worth saving in even so hazardous an occupation as war? On merely the gross basis of *financial economy* the life of a trained soldier is worth close upon $10,000.

Never was the medical arm of a service so well organized and perfected as it is in the United States Army and in the War *now really just beginning.* It has been demonstrated beyond all doubt that the Medical Department must be invested with adequate authority, not only to demand and enforce precautionary and curative measures agreed upon as essential, but also that the individual medical officer shall be empowered to carry out his rulings, *provided they do not jeopardize the military conduct of the War.*

Rank he must have to secure attention, to hold conferences with other military officers; also to get privileges, powers, even products, supplies and equipment, when and where essential, or of hospital supplies, etc. He must have quantivalent rank with those in command of military operations, or he is unheeded, much less are his requests granted.

To be sure other considerations than those of mere authority come in here. What is the crux of the objections? It is no longer natural for the military officer to be sensitive, to insist upon his traditional social status as a member of the "fighting arm" over all other branches of the service; the present war is showing a mortality among medical men quite as great if not greater in proportion than among the fighting men. Indeed, he need no longer be chary of conceding place at the military fireside to Doctors, Dentists, Veterinarians, and now Pharmacists. Again, are we a democracy or an aristocracy? Why the Army—why the Navy? To fight the battles of the country or each other? Who does the fighting? The enlisted man? What are the solemn obligations of the Government? To keep the fighting force in the pink of fighting condition, as far as possible, physically and mentally, by giving the medical man of the Army proper authority to enforce his medical judgment, or to have the medical men continue to take their orders in matters medical from non-medical men?

J. MADISON TAYLOR, M.D.

A METHOD FOR CLEANING DIGITALIS, WITH A STUDY OF THE INORGANIC CONSTITUENTS.

By C. H. ROGERS AND E. L. NEWCOMB.

For many years close observers have noticed the great variation in the cleanliness of different samples of digitalis. Even those who have been interested in the preparation of the drug from cultivated plants have called attention to the fact that an apparently unnecessary excess of foreign matter was often present in the drug produced. With these thoughts in mind an attempt was made in connection with the harvesting and preparation of the 1917 crop of digitalis produced in the Medicinal Plant Garden of the College of Pharmacy of the University of Minnesota to produce a drug with a minimum amount of adhering material.

COLLECTION AND DRYING.—The seedlings were transferred from the cold frames to the garden during the last of June and the first of July. The plants made an excellent growth and were irrigated during dry spells. Very few plants died during the season. The harvesting, which was done the latter part of September and the first of October, was practically completed before freezing weather set in, although there had been some slight frost. The total harvest represented approximately 600 Kg. of fresh leaves. The collecting was done largely by the students of the College of Pharmacy. All of the leaves were collected from plants of the first year's growth.

The leaves were collected by grasping a handful and cutting near the ground with a sharp knife, the lower parts of the petioles being left with the base of the plant. The more heavily laminated upper portions of the petioles were for the most part included with the drug collected. Only the rich green fully matured leaves were selected. The average yield of the green leaves, as determined by weighing the product from 500 plants, was 240 grammes per plant.

After collecting the leaves were taken into the Medicinal Plant Laboratory, where as much adhering soil as possible was removed by brushing. On account of the large quantity of drug collected it was impractical to hand brush the entire lot.

The soil in all of the plots in which the digitalis was grown was rather rich in humus admixed with sandy loam. The major portion of the ground was campus ground in lawn the preceding year and was plowed late in the spring. Attention should also be called to the fact that the plantings were for the most part adjoining a dusty and much-used driveway. During dry spells plants near the roadway were frequently covered with a grayish-white dust from the road. A number of rains just prior to collecting apparently removed the majority of the dust.

After brushing, the weighed leaves were spread one layer deep on screens or tin trays and placed in drying ovens which were heated by gas. On account of limited oven space the preliminary drying of part of the crop was carried out by placing the leaves on window screens, and these were then placed in the laboratory; the finishing, however, was done in the ovens. A temperature of approximately 80 degrees Centigrade was maintained until the petioles would break with a sharp fracture. Previous determinations have shown from two to four per cent. of moisture remaining in the leaves at this stage. The dried leaves were then weighed and the percentage of moisture lost determined. The average of numerous determinations showed a loss in weight on drying of between 80 and 82 per cent.

CLEANING PROCESS.—The dried leaves were placed in seven steel storage bins holding approximately 16 Kg. each. The subsequent cleaning and study of the drug was carried on some two months later, at which time it was desired to prepare the drug in a form suitable for the preparation of U. S. P. infusion and tincture. The handling of the dried drug gave evidence of the presence of much adhering and easily separable silt, although the product appeared much cleaner than the average commercial sample and was of a uniform rich green color. The ease with which the adhering material separated suggested the possibility of further cleaning by shaking the broken leaves on a coarse screen.

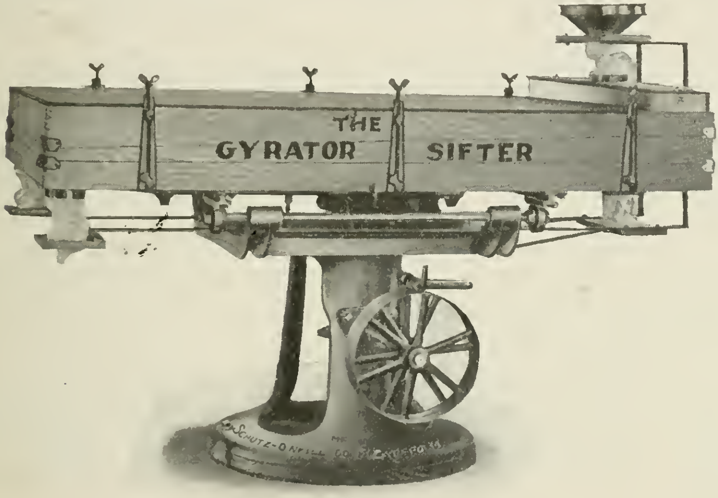

FIG. 1. Schutz-O'Neill Gyrator Sifter, used for special cleaning of digitalis and general drug sifting in the Drug Milling Laboratory, College of Pharmacy, University of Minnesota.

A bronze window screen having fourteen meshes to the linear inch was placed upon the body of a No. 1 Schutz-O'Neill Gyrator Sifter, the top and regular screen frame being first removed. A frame 3½ inches high was constructed around the edges of the window screen and fitted tightly down upon it. Approximately 2 Kg. of digitalis leaves were thrown upon the screen at one time, and then the machine, which was operated by a 2 H. P. motor, was set in motion. This operation resulted in separating 17.128 Kg. of screenings from a total of 81.984 Kg. of clean leaves. These screenings apparently contained much select drug, and it was deemed an unnecessary waste to discard the same; therefore, they were subjected to the following process:

One of the regular sifting frames supplied with the gyrator sifter was placed on the machine. This frame when used on the machine provides for the separation of the powder, being sifted into three degrees of fineness. Approximately three fifths of the area of the frame used is covered with a 50-mesh silk bolting cloth, one fifth with a 17-mesh linen screen and the remaining area is open for the tailings or coarse portion. The dust-proof top was placed on the machine and the 17.138 Kg. of screenings from the previous operation run through. This further separation yielded 5.97 Kg. of coarse tailings, 4.955 Kg. of middlings and 5.805 Kg. of fine powder. The coarse tailings and middlings were of a rich green color and apparently free from adhering soil. The tailings and middlings were returned to the cleaned drug from the screening process, after samples had been reserved for study. The fine powder was dark gray, faintly tinged with green.

The fine powder above referred to was submitted to a microscopical examination which revealed the presence of numerous typical hairs of digitalis, very few fragments of the lamina of the leaf and numerous particles of foreign matter, some of which were opaque and black, others being transparent and glasslike. Upon examination with the micropolariscope practically all of the transparent particles of foreign matter polarized light, the larger ones with a beautiful display of colors similar to those produced by feldspar.

Ash Determinations.—Ash determinations were made on the original drug before any of the cleaning processes were carried out and subsequently on the various separations effected. A composite sample carefully selected from the original crop yielded on three successive determinations 11.368 per cent., 11.38 per cent., and 11.59 per cent. of ash. While these figures are considerably below the percentage of ash permitted by U. S. P. IX, it was considered advisable to separate all of the foreign matter possible, thus producing a drug of exceptional cleanliness and probably within the two per cent. limit of foreign material.

The results of the separation by the two methods described together with ash determinations of the drug taken from each of the seven bins are given in the following two tables:

TABLE I.

Results of Screening Process in Cleaning Digitalis. With 14 Mesh Screen.

No. of Drug Bin.	Weight in Kg.	Wt. in Kg.† of C. Screen.	Per Cent.* Ash C. Screen.	Wt. in Kg.‡ of F. Screen.	Per Cent. Ash F. Screen
			9.237		26.64
1.	14.856	12.246	9.26	2.610	26.659
			9.183		18.9
2.	16.554	12.019	9.24	4.535	22.33
			9.224		38.00
3.	12.026	9.525	9.62	2.501	30.00
			9.49		24.85
4.	11.565	9.071	9.466	2.494	24.88
			9.755		21.29
5.	8.389	7.029	9.62	1.360	20.94
			8.99		31.92
6.	9.524	7.210	8.73	1.814	29.15
			9.25		24.63
7.	9.070	7.256	8.91	1.814	27.27
	Total	Total	Average	Total	Average
	81.984	64.356	9.284	17.138	26.24

* Samples were run through a No. 6 Sieve in order to obtain uniform portions for ash determinations and other tests.

† Coarse Screenings.

‡ Fine Screenings.

§ Lost during operation .398 Kg.

TABLE II.

Results of Gyrator Sifting Process in Cleaning Digitalis.

Total Wt. Kg. F. Screenings (See Table I).	Wt. in Kg. Coarse Tailings.	Per Cent. Ash Coarse Tailings.	Wt. in Kg. Middlings, 17 Mesh.	Per Cent. Ash Middlings.	Wt. in Kg. Fine Powder, 50 Mesh.	Per Cent. Ash Fine Powder.
		8.92		10.07		57.6
*16.730	5.970	8.91	4.955	10.26	5.805	56.02

* 398 Kg. reserved from first operation for sample.

Our knowledge of the chemical and pharmacological activity of foreign inorganic substances in digitalis is limited. It has been suggested by Wilbert[1] that, during the making of tincture or infusion, the clay may adsorb more or less of the therapeutically active constituents of the drug and thus render it less valuable. If such foreign matter were entirely inert a given quantity of such drug would be materially less active than if well cleaned. The normal ash of digitalis is probably between 8 and 10 per cent. Attention should be called to the fact that commercial samples have been reported upon which run over 25 per cent. of ash. Such samples of course would not come within the present U. S. P. IX limits. In case the foreign inorganic material adsorbs the therapeutically active constituents it would then seem especially important that all such extraneous matter be discarded.

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[1] Wilbert, *Bulletin,* Univ. of Wis., Serial 829, page 50.

A study of Table I clearly shows that by a process of screening, digitalis containing over 11 per cent. of ash may be separated into two portions, one yielding an ash content of 9.284 per cent., and the other passing through a screen of fourteen meshes to the linear inch, yielding 26.24 per cent. The second portion represented approximately 20 per cent. of the entire quantity, to discard all of which seemed an unnecessary waste, especially as its ash content indicated that it was about four fifths digitalis.

The second table shows that a further process of separation may be employed to almost completely separate the foreign inorganic material. The fine siftings yielded over 56 per cent. of ash, while the coarser portions were approximately 9 and 10 per cent., respectively. The total weight of fine siftings was 5.805 Kg. or approximately 7 per cent. loss from the original drug. This may seem like a considerable loss, especially to those who handle digitalis in large quantities. The actual loss of digitalis, however, is less than 3½ per cent., the remaining portion being foreign matter.

In view of the unquestionable wide variation in the chemical nature of the foreign material which may be present, it would seem desirable to carry the process of elimination of foreign matter just as far as possible, notwithstanding the fact that it may increase the cost of the drug. The U. S. P. IX definition for digitalis permits not more than two per cent. of foreign matter. The requirement is also made that the ash of digitalis shall not exceed fifteen per cent. In other words, there is an allowance for variation in the normal ash of digitalis up to thirteen per cent. While some may question the advisability of requiring digitalis to be 98 per cent. pure, nevertheless by the application of methods as outlined in this paper such requirement is apparently met with even when the foreign matter consists chiefly of microscopic material.

Special Digitoxin Tests.—Qualitative chemical tests for the presence of digitoxin were made on the portions separated in the cleaning process. The method employed in conducting these tests was as follows: Ten mils of a 10 per cent. infusion of digitalis leaves were placed in a separatory funnel, ten mils of chloroform added and the two liquids shaken. The mixture was allowed to settle and then 10 mils of a mixture of equal parts of 95 per cent. alcohol and ether were added. The chloroform-ether mixture was filtered off and evaporated. The residue was dissolved in 3 mils of acetic acid. To this solution one drop of a 10 per cent. solution of ferric chloride was added and then a layer of sulphuric acid was introduced at the lower portion of the test tube, by means of a pipette. A brown red color changing to a bluish green at the zone of contact is indicative of digitoxin (the digitoxin zone).

The results of the application of the test when applied to each of the separated portions are given in the following table:

TABLE III.

Digitoxin Tests.

Petioles. (See Table No. 5.)	Coarse Screenings. (Table No. 1.)	Coarse Tailings. (Table No. 2.)	Middlings. (Table No. 2.)	Fine Powder. (Table No. 2.)
Faint	Positive	Positive	Positive	Negative

It will be noted that all samples gave a positive reaction for digitoxin with the exception of the fine siftings which yielded 56 per cent. of ash and which on microscopic examination revealed practically no tissues of digitalis leaf except the trichomes. These tests on the siftings are particularly interesting in that they indicate that the hairs of digitalis are devoid of digitoxin. The elimination then of siftings in this case would in no way be detrimental to the drug unless other medicinally valuable glucosides were present. Whether or not these fine siftings have a detrimental effect upon the quality of tinctures or infusions prepared from the drug will be reported upon in a subsequent paper.

Attention is here called to what is apparently an error in considering the green color developing in the above so called digitoxin test as digitoxin. Digitoxin is insoluble in water and hence cannot possibly be present in the infusion unless solution is effected by the presence of other substances in the leaf. Our extensive work with Digitalis during the past six years has uncovered much evidence which leads us to believe that digitoxin does not exist as such in the leaf of the growing digitalis plant. The immediate drying by artificial heat of the freshly collected digitalis leaves undoubtedly lessens the formation of decomposition products one of which may be digitoxin. It is our opinion that the green color zone in the above test is due to digitalein rather than digitoxin.

The Discarding of Fine Portions.—The question of the advisability of discarding the finer portions of digitalis during the process of grinding may be determined only by taking into consideration a number of factors. In any event, the drug should be cleaned as thoroughly as possible before grinding and the nature and ash content of the finer portion of the grind should be determined before it is eliminated. By the use of the Schutz-O'Neill Limited Pulverizer "set fine" and run at a speed of 3,300 R. P. M. or faster, a thoroughly dried digitalis leaf may be reduced at one operation to such a degree of fineness that 75 per cent. or more will pass through an 80-mesh bolting cloth at the first sifting, a large proportion of the powder being finer than a number 80. In such powder much of the drug may be in fine particles of the same size as adhering inorganic matter and obviously it would be a mistake to throw away the finer parts of such a portion. Grinding in this manner is advisable for the preparation of digitalis to be dispensed in one-grain capsules on physicians' prescriptions. On the other hand, a coarse grind of digitalis may yield a relatively

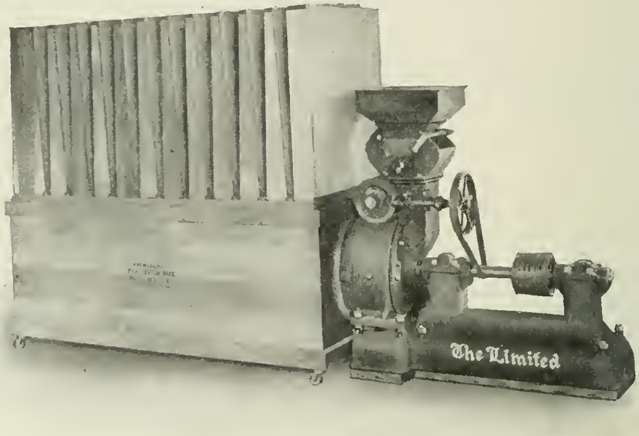

Fig. 2. Schutz-O'Neill Limited Pulverizer, used for the preparation of uniform finely powdered digitalis and other drugs. One of seven mills in the Drug Milling Laboratory, College of Pharmacy, University of Minnesota.

small proportion of number 80 powder which may run high in ash, depending upon the thoroughness of the cleaning process and the character of the soil in which the plant is grown, *i. e.,* fine clay or coarse sandy humus.

In this connection it is interesting to note that many of the ash determinations reported in the literature for digitalis and based upon examination of drug prepared from wild-growing plants represent low ash figures. It is reasonable to believe that wild-growing plants well mulched with roadside grass, leaves or other organic material would be protected to a greater degree from inorganic contamination than field-grown plants under intensive cultivation.

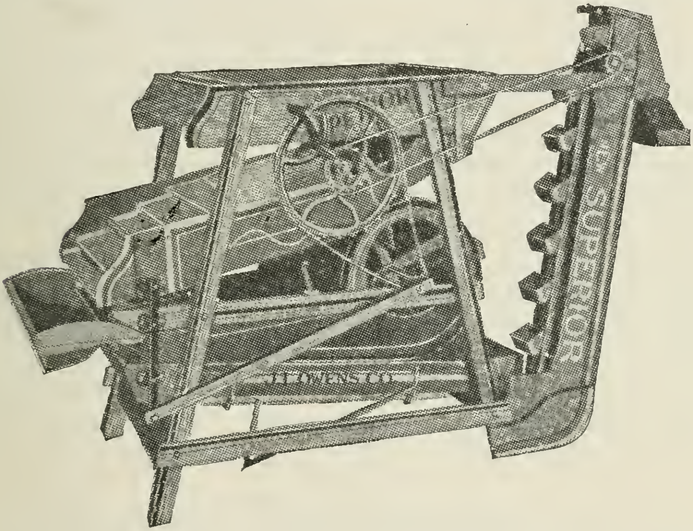

Fig. 3. Owens Superior Fanning Mill, used for special preparation of digitalis for infusion, the cleaning of drug seeds, fruits and other purposes, Drug Milling Laboratory, College of Pharmacy, University of Minnesota.

Preparation of Digitalis for Infusion.—A portion of the cleaned digitalis leaves was to be used for the manufacture of the official infusion. The leaves were to be packed in number 10 one-ounce-capacity gelatin capsules, each containing 3.75 grammes, sufficient to prepare 250 mils of infusion, the usual amount prescribed. The U. S. P. directs that bruised digitalis be used for the preparation of the infusion. An attempt to bruise the properly prepared digitalis, produced in Minnesota, resulted in the immediate production of a very fine powder due to the fact that the drug contains very little moisture, is chiefly parenchymatous and is therefore easily pulverized. A fine powder is unquestionably not desired for the preparation of the infusion. It would be an improvement if the U. S. P. formula directed the use of digitalis in number 6 powder. This would insure a uniformity in the degree of fineness which is not likely to be obtained when using a variety of samples and following the present directions.

In order to reduce the Minnesota digitalis to a proper degree of comminution for the preparation of the infusion the following process was employed. The cleaned leaves were run through a sieve having six meshes to the linear inch. This operation resulted in reducing the entire product to fragments of approximately one sixth inch in diameter, some of the petioles however went through the sieve endwise and were two inches or more in length. Obviously it would have been difficult to have packed the capsules with these long petiole fragments present. The next problem therefore was to separate the long fragments of petioles. This was quickly and efficiently accomplished by running the broken drug through an Owen's Superior Fanning Mill which was driven by a 2 H. P. motor and which was fitted with screens as follows: The upper tier of screens used represented a "zinc wheat gang" of four frames (having circular perforations one fifth of an inch in diameter). The lower sand frame used was a regular 30 × 30 wire screen. The fan was shut off entirely. The drug was then run through and three separations obtained as follows:

TABLE IV.

Select and quite uniform number six drug	7.029	Kg.
Petiole fragments, 1 to 8 cm. in length with practically no lamina present	1.6	Kg.
No. 30 passing thru the lower screen..............loss,	375.	Gm.

Total ash determinations were made of the three separations, which gave the following results:

TABLE V.

	Select Portion.	Petiole Fragments.	No. 30 Powder.
A..................	8.85	8.78	12.81
B..................	8.97	8.75	13.97
Average	8.91	8.76	13.3

It will be noted that the coarse lamina and petiole portions, both of which were practically free from adhering matter, gave nearly an identical amount of ash. This is probably explained by the fact that they both consist primarily of parenchyma tissue. The finer portion shows an increase in the per cent. of ash as was the case in the previous cleaning process.

Some of the separated petiole fragments were tested for digitoxin by the method previously described. The result, which is recorded in Table III, it will be noted, was not more than a very faint trace. In view of the large amount of mucilaginous material present in the petioles we feel that this statement should be confirmed by physiological methods.

THE CHEMICAL EXAMINATION OF THE ASH.—On account of the possible effect of foreign inorganic material in the digitalis, it is highly important that the chemical composition of the same be known. Qualitative and quantitative examinations were therefore made of the ashes obtained by incinerating the portions separated by the cleaning processes.

Qualitative determinations were made on (*A*) ash of digitalis cleaned by screening, (*B*) ash of digitalis middlings, (*C*) ash of digitalis siftings, (*D*) ash of fine powder from digitalis siftings. Positive reactions were obtained from each of the above samples for iron, aluminum, manganese, calcium, magnesium, potassium, sodium, silicon and carbonates. Negative results were obtained for lead, mercury, silver, bismuth, copper, cadmium, arsenic, strontium, tin, chromium, cerium, nickel, zinc, cobalt, barium, antimony, lithium, chlorides, sulphates, nitrates, phosphates.

The presence or absence of manganese in digitalis has been the subject of a number of investigations. Our results tend to indicate that in Minnesota digitalis it is present only in small amounts. This confirms the earlier results obtained by one of us (Newcomb[2]), also by Burmann.[3] Manganese was positively identified in the ash of the clean digitalis leaves by the following tests:

(*a*) In neutral solution by ammonium sulphide—flesh-colored precipitate of MnS.

(*b*) Nitric acid solution with lead peroxide—violet-colored solution.

(*c*) Heating on platinum foil with KOH and potassium nitrate—green color.

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[2] Newcomb, AMER. JOUR. PHARM., Vol. 84, pp. 201–214.

[3] Burmann, *Schweiz. Wochschr.*, 1911, p. 562.

(*d*) Heating on platinum foil with KOH and potassium chlorate—green color, changed to purple of permanganates upon boiling with water.

Samples of soil from the plots from which the digitalis was grown were collected, incinerated and tested for the presence of manganese by methods as given above. The results were positive.

Particular attention should be called to the method employed in conducting tests "*c*" and "*d*." When a considerable quantity of manganese is present in the ash, as in Stafford Allen and Sons, English digitalis, or in digitalis from the state of Washington, only a small amount of KOH and potassium chlorate is necessary to produce the characteristic green color, however, when the amount of manganese is extremely small as in Minnesota digitalis, it is necessary to use larger quantities of these reagents, in order to observe the reaction satisfactorily.

The test for potassium also indicates that it is a normal constituent of the leaf. On account of the excessive cost of reagent potash was not run quantitatively.

PERCENTAGE OF ASH INSOLUBLE IN HCL.—The following table clearly indicates that the 9.284 per cent. of ash obtained from the clean digitalis by screening contained but very little foreign matter, as only 4.35 per cent. of the ash was insoluble in hydrochloric acid. On the other hand nearly two thirds of the screenings ash represented material insoluble in HCl. This quality of the ash is even

TABLE VI.

HCl Insoluble Ash in Digitalis.

Material.	Determination.	Percentage Ash Average.	Percentage of Ash Insol. in HCl.	Percentage of Ash Insol. in HCl—Average.
Digitalis cleaned by screening..........	1	9.284*	4.47	4.35
	2		4.23	
Digitalis screenings..................	1	26.24*	60.45	61.65
	2		62.86	
Digitalis middlings and siftings........	1	8.915†	10.20	9.41
	2	10.16†	8.63	
Fine powder from digitalis siftings......	1	56.81	70.98	70.99
	2		71.00	

* Average of 14 samples.

† No. 1, Tailings; No. 2, Middlings. Samples mixed for insol. ash determinations.

more pronounced in the second table which shows that 71 per cent. of the fine powder ash was insoluble in HCl. The tables illustrate that there is a direct relation between the percentage of HCl insoluble ash and the amount of inorganic foreign matter in the drug.

Quantitative Ash Determinations.—The following table shows the amount of elements present in the ash, calculated as oxides, and the alkalinity representing chiefly carbonates. It will be noted that the high percentage of ash caused by foreign matter was due chiefly to silica with some aluminum. The high percentage of alkalinity in the ash of the clean drug as compared to that of the siftings would indicate the combination of iron, calcium, magnesium, potassium and sodium with organic acids in the normal leaf, and the relatively small amount of these salts in the ash of the siftings. The small amount of these salts in the ash of the siftings, the low alkalinity together with the dual capacity in which some of these elements occur make it difficult if not impossible to correctly proportionate the constituents.

Table VII.

Quantitative Table of Inorganic Constituents of Digitalis.

Ash of	Determination.	Total Siliceous Material.	Si as SiO_2.	Iron as Fe_2O_3.	Al as Al_2O_3.	Ca as CaO.	Mg as MgO.	K and Na as K_2O–Na_2O.	Mils N/10 H_2SO_4 per Gm. Ash M. O. Ind.*
Digitalis cleaned by screen.....	*A*	11.58	10.84	9.59	3.62	20.10	23.93	31.18†	42.56
	B	11.53	10.67	9.52	3.51	20.03	23.53	31.88†	42.59
	Av.	11.55	10.76	9.55	3.56	20.06	23.73	31.53	42.575
Fine powder from siftings	*A*	73.18	44.75	5.04	3.33	9.45	9.77		8.08
	B	73.41	45.16	5.32	3.46	9.21	9.15		8.12
	Av.	73.29	44.96	5.18	3.39	9.33	9.46		8.10

Summary.—Foreign inorganic material adhering to dry digitalis leaves may be easily separated by a mechanical process.

By the application of such process supplies of digitalis may be made much more uniform with respect to adhering material.

The evident variation in the chemical nature of foreign material which may be present would seem to demand that the process of elimination be carried just as far as practical.

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* Methyl orange used as indicator.

† By difference.

The small amounts of digitalis lost in the processes of cleaning are not sufficient to give satisfactory reactions for digitoxin by qualitative chemical tests.

The digitalis lost in the cleaning process consists chiefly of the hairs of the leaf which apparently contain no digitoxin.

The advisability of discarding the finer portions of digitalis during the process of grinding is dependent upon the nature of the foreign matter and the method of milling employed. All digitalis should be well cleaned before being milled.

The total ash of leaves from cultivated plants usually averages higher than the ash of leaves from wild-growing plants.

The rapid increase in the supplies of digitalis from cultivated plants suggests the necessity of giving special attention to the cleaning process.

The U. S. P. requirement that digitalis for infusion be bruised does not insure uniformity in degree of fineness of drug, which different pharmacists use in making infusions. It would be advisable if the U. S. P. formula directed the use of digitalis in number 6 powder for the same. A mechanical process may be employed to reduce the drug to a uniform number 6 powder. The petioles are deficient in digitoxin, appear to contain much mucilaginous material and may largely be separated in producing a uniform number 6 powder.

Gelatin capsules afford an excellent means for packing digitalis to be used in making infusions.

The total percentage ash of clean petioles of digitalis is approximately the same as the clean lamina portions.

Manganese appears to be a constant constituent of digitalis leaves but varies in amount in samples obtained from different sources.

Siliceous foreign matter insoluble in HCl may be almost entirely separated by a cleaning process.

Digitalis produced in Minnesota normally contains iron, calcium, magnesium, manganese, potassium and sodium.

The small percentage of aluminum occurring as a silicate in the Minnesota digitalis would indicate that the therapeutic activity of preparations made from this drug would not be seriously impaired by the adsorptive properties of the silicate.

TINCTURE OF GINGER U. S. P.

By J. P. Snyder,

Norwich, N. Y.

The U. S. P. directs that tincture of ginger shall be made from Jamaica ginger and percolated with 95 per cent. alcohol and that a tincture of ginger so made shall meet the following requirements:

Evaporate 10 Gm. of tincture of ginger to dryness in a tared dish on the water-bath; the yield does not exceed 2 per cent. When treated with 20 mils of cold distilled water, not more than 15 per cent. of this residue dissolves. It contains about 90 per cent. of alcohol and in addition to these requirements a qualitative test is given by which capsicum or other pungent substitutes are detected. When one carefully examines the above standards, he finds that the only one which is really worth while and which attains its object, of preventing adulterated tincture finding its way upon the market, is the alcohol requirement of about 90 per cent. In fact, the statement that it shall not yield more than 2 per cent. of solids in reality invites adulteration by the unscrupulous. For it has definitely been shown by several different investigators that the average total solids of tincture of ginger is in the neighborhood of 1.5 per cent. and, at present, with the U. S. P. standard of not more than 2 per cent. solids, there is nothing that would prevent one from adding to the average tincture of ginger percolated with 95 per cent., once or twice its volume of straight alcohol, and still have a product that would meet the Pharmacopœia requirements, although in reality it would only be one half strength or less. In fact, it is possible to have a strictly U. S. P. preparation that would fail to meet the standard of the Food and Drug Department, which is, or at least has been, that tincture of ginger shall contain in each 100 Cc. the alcohol-soluble of 20 Gm. of ginger.

The U. S. P. requirement, that not more than 15 per cent. of the solids is soluble in 20 mils of water, has given rise to considerable discussion, as it seems possible to prepare a tincture of ginger from strictly prime Jamaica ginger root that fully meets the U. S. P. requirements and find that more than 15 per cent. of the solids are soluble in 20 Cc. of water. This condition may, however, be brought about by lack of definite directions in the Pharmacopœia for obtaining the water-soluble solids While the U. S. P. states the amount of water with which the solids are to be treated, it does not state the length of time which the water is to remain in contact with the solids and whether it is to be 5, 10, or 15 minutes, 1 hour, 2 hours, or three hours or longer, is left entirely to the discretion of the analyst, and as the amount of water-soluble solids will vary with the length of time the water is left in contact with the solids, it should be definitely stated how long this should be. From the fact that, after adding water to the solids, a sticky gummy mass results, the average chemist would probably leave it in contact with the water for, at least, a couple of hours, and rub it frequently with a rubber-tipped rod.

Since we have been finding that several of the tinctures of ginger have yielded by our interpretation of the water-soluble method of the U. S. P. results higher than 15 per cent., it has occurred that it might be advisable to consult available literature upon the subject, prepare samples and make a general investigation.

Street and Morrison, Bulletin 137, U. S. P. Dept. of Agriculture, give the following method for determining water-soluble solids: "Add 15 to 20 Cc. of water, at room temperature, to the residues obtained in the total solids determination. Stir with a glass rod at frequent intervals during the three hours. Because of the gummy character of many residues, it is sometimes difficult to secure contact with the solvent. Wash into a 50 Cc. flask with water and make up to the mark. Filter this solution through a dry plaited filter and evaporate an aliquot of 25 Cc. and dry to constant weight in a water oven."

The U. S. P. excludes this method of Street & Morrison, when it specifies only 20 Cc. of water, for, of course, the residue could not then be washed with sufficient water to bring it up to 50 Cc.

Street and Morrison prepared one sample of tincture of ginger and determined the total solids to be 1.43 per cent., 14.7 per cent. of which was soluble in water by the method given above. From the results of this one tincture of ginger they concluded that properly prepared tincture of ginger should show a specific gravity of about 0.82 and contain, at least, 93 per cent. of alcohol by volume, from one or two per cent. of solids, practically all of which is soluble in alcohol, and not over 15 per cent. soluble in cold water.

Street and Morrison, in drawing conclusions from one sample of tincture of ginger, have at least very little scientific data to base their claims upon, and in placing the limit for water-soluble solids at 15 per cent., when they found 14.7 per cent., they have adopted an extremely narrow limit. When it is taken into consideration that they are using a method which will show variations greater than 0.3 per cent. in the hands of different operators, as they themselves state in their method, that "because of the gummy character of many of the residues, it is sometimes difficult to secure proper contact with the solvent."

In the same article, we read the following: "34 samples sold as flavoring extracts and 14 sold as tincture of ginger were examined, but only the analysis of certain ones which are typical and a general summary of all samples will be given. Seven of the extracts were classed as standard composition and seven as legally labeled compounds and twenty as below standard, or adulterated. *Of the tinctures, 12 are of standard quality.* As the tinctures are of special interest to us an examination of the analytical data accompany this article is advisable, from which we find that the average analysis of these 12 standard tinctures is as follows:

Specific gravity	0.8371
Alcohol by volume	93.33
Total solids	1.38
Soluble in alcohol	1.30
Soluble in water	0.23
Per cent. of the total solids soluble in alcohol	96
Per cent. of the total solids soluble in water	17

In one paragraph we read that they conclude, from one sample of tincture of ginger prepared by them, that not over 15 per cent. of the solids should be soluble in water, and, in another, that the average of the water-soluble of 12 standard tinctures is 17 per cent. This, surely, is not consistent, to state that the water-soluble should be less than 15 per cent. and then to consider as standard quality 12 tinctures, the average water-soluble of which is 17 per cent.

Lythgoe and Nurenburg, *Journal of Industrial and Engineering Chemistry*, December, 1911, prepared a sample of tincture of ginger, using 200 Gm. of Jamaica ginger to the liter and percolated with 95 per cent. alcohol. They present the following analysis:

	Per Cent.
Alcohol by volume	88.76
Total solids	1.40
Soluble in alcohol	1.33

Water-soluble	0.24
Per cent. of total solids soluble in alcohol	95
Per cent. of total solids soluble in water	18

In addition to this the authors also examined 4 tinctures of ginger, which they consider to be strictly U. S. P., and the following are part of the results which they obtained:

	Alc. by Vol.	Total Solids.	Alc. Soluble, Per Cent.	Water Sol.	Per Cent. of Solids Sol. in	
					Alc.	Water.
1	91.64	1.23	1.09	0.10	88	8.1
2	88.84	1.26	1.16	0.19	94	15.1
3	88.04	1.59	1.38	0.27	86	17.0
4	78.92	1.48	1.47	0.24	99	16.2

Here are 4 tinctures of ginger, one of which was prepared by the authors themselves, which yields a per cent. of solids soluble in water, greater than 15, and are considered strictly U. S. P. Of course they were examining these tinctures according to the U. S. P. VIII, where no standards were given for tinctures of ginger, but there is no reason to presume that tincture of ginger, made at that time, using the same quantity of Jamaica ginger and the same alcoholic menstruum, should not yield results similar to those of the tinctures prepared at this time by the U. S. P. IX method.

Harrison and Sullivan, Association of Official Agriculture Chemists, give the results of analysis of about 25 tinctures of ginger, many of which they prepared themselves, and from their results concluded that tincture of ginger U. S. P. should comply with the following requirements. Specific gravity at 25° C. not above 0.827. Alcohol by volume not less than 90 per cent. Non-volatile matter from 1.25 to 1.75 per cent. They did not even find it necessary to determine the water-soluble portion of the solids and accordingly have given no requirements in the standards which they propose.

A sample of tincture of ginger was prepared in our laboratory from Jamaica ginger, which met the botanical description of the U. S. P. and gave the following results when examined chemically:

Alcohol-soluble	6.45 per cent.	U. S. P. plus 4 per cent.
Non-volatile, ether-sol.	4.47 per cent.	U. S. P. plus 2 per cent.
Water-soluble	10 per cent.	U. S. P. plus 8 per cent.
Ash	3.7 per cent.	U. S. P. plus 8 per cent.

These results would indicate that the Jamaica ginger met the U. S. P. requirements in every particular. The alcohol used in the percolating of the ginger contained 94.9 per cent. by volume of absolute alcohol. The specific gravity of the tincture made from this ginger was 0.8173 and it contained 88.5 per cent. of alcohol by volume. For the determination of the water-soluble solids, 4 samples of approximately 10 Gm. each were evaporated to dryness on the steam bath and dried in desiccator. The U. S. P. directs that 10 Gm. be used, but as it is out of the question to weigh accurately exactly 10 Gm. of a volatile substance like tincture of ginger, about 10 Gm. were taken in each case. The following are the results obtained for total solids from these four samples:

1. 1.80 per cent.
2. 1.77 per cent.
3. 1.81 per cent.
4. 1.85 per cent.

In addition two other samples were evaporated to dryness on the steam bath and then dried in the oven to constant weight at 100° C. and gave the following results:

5. 1.74 per cent.
6. 1.76 per cent.

To sample No. 1 20 Cc. of water were added and the solids thoroughly rubbed with a rubber-tipped glass rod to bring the sticky mass of solids in contact with the water. The water, after remaining on the ginger solids for five minutes was removed, filtered through 9 Cm. filter and the first two or three Cc. rejected.

Sample No. 2 was treated in the same manner as No. 1 with the exception that the water was allowed to remain in contact with the solids for 15 minutes, No. 3 for 1 hour and 30 minutes and No. 4 for 2 hours and 30 minutes. 10 Cc. of the filtrates, from each of the samples were transferred to a tared evaporating dish and evaporated to dryness, dried to constant weight at 100° C. and the following water-soluble percentages obtained.

1. 16.7 per cent.
2. 18.8 per cent.
3. 22.9 per cent.
4. 21.5 per cent.

CONCLUSIONS.

From the above it would appear that tincture of ginger, the percentage of water-soluble solids of which are greater than 15 per cent., can be prepared from strictly U. S. P. Jamaica ginger, using 95 per cent. alcohol as the menstruum. This is confirmed by Lythgoe and Nurenburg and, in a way, by Street and Morrison who, although they consider that tincture of ginger should yield less than 15 per cent. of water-soluble solids, find that 12 tinctures of ginger are of standard quality, in which the average yield of solids soluble in water is 17 per cent.

The per cent. of water-soluble solids is variable, depending upon the length of time the water is allowed to remain in contact with the solids and also, to a great extent, upon the manner in which the solids are brought in contact with the water. If the water-soluble solids requirement serves any practical purpose, and it is to be retained, the U. S. P. should state the way and manner in which it is to be obtained, and also establish a limit that can be met when the tinctures are prepared from the U. S. P. Jamaica ginger and 95 per cent. alcohol.

In determining the total solids, the statement in the Pharmacopœia should be changed from "Evaporate 10 Gm. of tincture of ginger" to "Evaporate about 10 Gm. of tincture of ginger accurately weighed," as the tincture is volatile and it is impractical and unnecessary to weigh exactly 10 Gm. Also it would probably be better to state that the total solids should be dried to constant weight at 100° C., as somewhat lower results may be obtained and also more accurate checks if the determination is made in this manner. *The minimum limit as well as the maximum should be stated for the total solids to prevent adulteration by dilution.* The following standards in addition to qualitative tests for capsicum or other pungent substitute would probably be all that would be necessary to prevent adulteration of tincture of ginger and at the same time show the product to be of a good quality.

Alcohol about	90	per cent. by volume.
Specific gravity about	0.82	
Non-volatile solids, not more than	1.75, nor less than 1.25 per cent.	

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METHODS OF GAS WARFARE.[1]

By S. J. M. Auld, British Military Mission.

(Communicated by L. J. Briggs.)

All I can do in the short time available is to give you, if I can, a general idea of what gas warfare really means on the Western Front at the present time. Some of you may have gotten the idea that gas is just an incident, and that there is not as much attention being paid to it as there was two years ago. That idea is entirely wrong. Gas is used to a tremendous extent, and the amount that has been and is being hurled back and forth in shells and clouds is almost unbelievable. I will try to give you a general idea of what is occurring and make the lecture rather a popular than a technical description. I shall also, for obvious reasons, have to confine myself to describing what the Germans have been doing, and will say nothing about what we are doing.

Possibly the best plan would be to state more or less chronologically what occurred. I happened to be present at the first gas attack and saw the whole gas business from the beginning. The first attack was made in April, 1915. A deserter had come into the Ypres salient a week before the attack was made, and had told us the whole story. They were preparing to poison us with gas, and had cylinders installed in their trenches. No one believed him at all, and no notice was taken of it.

Then came the first gas attack, and the whole course of the war changed. That first attack, of course, was made against men who were entirely unprepared—absolutely unprotected. You have read quite as much about the actual attack and the battle as I could tell you, but the accounts are still remarkably meager. The fellows who could have told most about it didn't come back. The Germans have claimed that we had 6,000 killed and as many taken prisoners. They left a battlefield such as had never been seen before in warfare, ancient or modern, and one that has had no compeer in the whole war except on the Russian front.

What the Germans expected to accomplish by it I am not sure.

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[1] Report of a lecture delivered before the Washington Academy of Sciences on January 17, 1918. Reprinted from *Journal of the Washington Academy of Sciences.*

Presumably they intended to win the war, and they might conceivably have won it then and there if they had foreseen the tremendous effect of the attack. It is certain that they expected no immediate retaliation, as they had provided no protection for their own men. They made a clear and unobstructed gap in the lines, which was only closed by the Canadians, who rallied on the left and advanced, in part through the gas cloud itself.

The method first used by the Germans, and retained ever since, is fairly simple, but requires great preparation beforehand. A hole is dug in the bottom of the trench close underneath the parapet, and a gas cylinder is buried in the hole. It is an ordinary cylinder, like that used for oxygen or hydrogen. It is then covered first with a quilt of moss, containing potassium carbonate solution, and then with sand bags. When the attack is to be made the sand bags and protecting cover are taken off the cylinder, and each cylinder is connected with a lead pipe which is bent over the top of the parapet. A sand bag is laid on the nozzle to prevent the back "kick" of the outrushing gas from throwing the pipe back into the trench. Our own methods are practically identical with those first used by the Germans.

The success of a cloud gas attack depends on thorough preparation beforehand. The attackers must know the country, the layout of the trenches, and the direction and velocity of the wind with certainty. Favorable conditions are limited practically to wind velocities between twelve and four miles an hour. A wind of more than twelve miles an hour disperses the gas cloud very rapidly. An upward current of air is the worst foe of gas. The weight of the gas is not an important factor in carrying it along, for it mixes rapidly with air to form the moving "cloud." The time occupied by a gas attack is too short to permit of much diffusion of the gas out of the original mixture.

The gas attack must be planned very carefully. If the trench line is very irregular it is likely that gas will flow into a portion of one's own trenches. The limits of safety in wind direction are thus determined by the direction of the lines of the trenches. The Germans use a 40° angle of safety; that means that on a given straight portion of the front the wind direction must lie between the two directions which make angles of 40° with the neighboring sections of the front. The most suitable type of country is where the ground slopes gently away from where the gas is being discharged. The Germans made one mistake in believing that hilly or wooded country would not do. This was refuted by the French, who made a successful gas attack in hilly and wooded country in the Vosges, as admitted in a captured German report. If the country is flat like that about Ypres, and the wind direction is right, there is very little difficulty about making an attack, especially if the enemy does not know anything about it. The element of surprise is important.

German gas attacks are made by two regiments of Pioneers, with highly technical officers, including engineers, meteorologists, and chemists. They brought their first cylinders into the line without our knowing anything about it, except from the deserter's report, which was not believed. The element of surprise was greatly lessened when we began to know what to look for and to recognize the sounds incident to the preparation of a gas attack.

The first attack was made with chlorine. If a gas attack is to be made with gas clouds, the number of gases available is limited. The gas must be easily compressible, easily made in large quantities, and should be considerably heavier than air. If to this is added the necessity of its being very toxic and of low chemical reactivity, the choice is practically reduced to two gases: chlorine and phosgene. Chlorine is to gas warfare what nitric acid is to high explosives. Pure chlorine did not satisfy quite all the requirements, as it is very active chemically and therefore easily absorbed. Many men in the first attack who had sufficient presence of mind saved themselves by burying their faces in the earth, or by stuffing their mufflers in their mouths and wrapping them around their faces.

There were several gas attacks of almost exactly the same kind early in 1915. There was no gas between the end of May, 1915, and December, 1915, and by that time adequate protection had been provided.

The first protection was primitive. It consisted largely of respirators made by women in England in response to an appeal by Kitchener. They were pads of cotton wool wrapped in muslin and soaked in solutions of sodium carbonate and thiosulphate; sometimes they were soaked only in water. A new type appeared almost every week. One simple type consisted of a pad of cotton waste wrapped up in muslin together with a separate wad of cotton waste. These were kept in boxes in the trenches, and on the word "gas" six or eight men would make a dive for the box, stuff some waste into their mouths, then fasten on the paid and stuff the waste into the space around the nose and mouth. But this got unpopular after a bit, when it was discovered that the same bits of waste were not always used by the same men. During the early part of 1915 this was the only protection used.

Then came the helmet made of a flannel bag soaked in thiosulphate and carbonate, with a mica window in it. A modified form of this device with different chemicals is still used in the British army as a reserve protection. It is put over the head and tucked into the jacket, and is fool-proof as long as well tucked down. This stood up very well against chlorine.

In 1915 we got word from our Intelligence Department of a striking kind. It consisted of notes of some very secret lectures given in Germany to a number of the senior officers. These lectures detailed materials to be used, and one of them was phosgene, a gas which is very insidious and difficult to protect against. We had to hurry up to find protection against it. The outcome was a helmet saturated with sodium phenate. The concentration of gases when used in a cloud is small, and 1 to 1,000 by volume is relatively very strong. The helmet easily gave protection against phosgene at a normal concentration of 1 part in 10,000. That helmet was used when the next attack came in Flanders, on the 19th of December. This attack was in many ways an entirely new departure and marked a new era in gas warfare.

There are three things that really matter in gas warfare, and these were all emphasized in the attack of December. They are: (1) increased concentration; (2) surprise in tactics; (3) the use of unexpected new materials.

Continued efforts have been made on both sides to increase the concentration. The first gas attack, in April, 1915, lasted about one and a half hours. The attack in May lasted three hours. The attack in December was over in thirty minutes. Thus, assuming the number of cylinders to be the same (one cylinder for every meter of front in which they were operating), the last attack realized just three times the concentration of the first, and six times the concentration obtained in May. Other cloud gas attacks followed, and the time was steadily reduced; the last attacks gave only ten to fifteen minutes for each discharge. We believe that the cylinders are now put in at the rate of three for every two meters of front, and may even be double banked.

The element of surprise came in an attack by night. The meteorological conditions are much better at night than during the day. The best two hours out of the twenty-four, when steady and downward currents exist, are the hour between sunset and dark and the hour between dawn and sunrise. Gas attacks have therefore been frequently made just in the gloaming or early morning, between lights. This took away one of the easy methods of spotting gas, that of seeing it, and we had to depend upon the hissing noises made by the escaping gas, and upon the sense of smell.

Another element of surprise was the sending out of more than one cloud in an attack. After the first cloud the men would think it was all over, but ten minutes or half an hour later there would come another cloud on exactly the same front. These tactics were very successful in at least one case, namely, the attack near Hulluch in 1916. Some of the troops discarded their helmets after the first wave and were caught on the second, which was very much stronger than the first.

Efforts were also made to effect surprise by silencing the gas. But silencers reduced the rate of escape so greatly that the loss of efficiency from low concentration more than made up for the gain in suddenness. Another method was to mix the gas up with smoke, or to alternate gas and smoke, so that it would be difficult to tell where the gas began and the smoke ended.

The last attack made on the British by this means was in August, 1916. Since that time the Germans have used gas three times on the West Front against the French, and have also used it against the Italians and the Russians. It has been practically given up against the British, although the method is by no means dead.

The last attack was a slight set-back in the progress of gas defense. The casualties had been brought down to a minimum, and, as shown by the fact that the percentage of deaths was high, protection was complete in all cases where used, casualties being due to unpreparedness in some form. The attack in question was brought on under difficult conditions for the defenders, as it was made on new troops during a relief when twice as many men were in the trenches as normally. Furthermore, they had to wear helmets while carrying their complete outfit for the relief. This was the second time the Germans caught us in a relief, whether through information or luck we cannot say.

The protection that had been devised against phosgene proved effective at the time, but provision was made to meet increased concentration of phosgene. We never had any actual evidence during the attack that phosgene was being used, as no samples were actually taken from the cloud, but cylinders of phosgene were captured later. Glass vacuum tubes, about 10 by 30 Cm., with a tip that could be broken off and then closed by a plasticine-lined glass cap, were distributed, but the only one that came back was an unopened tube found in a hedge, and marked by the finder "Dangerous; may contain cholera germs." In a gas attack everybody keeps quiet or else has a job on hand, and conditions are not conducive to the taking of gas samples. The original types of vacuum tube were smaller than those now used.

There was a long search for materials that would absorb phosgene, as there are few substances that react readily with it. The successful suggestion came from Russia. The substance now used very extensively by all is hexamethylenetetramine (urotropine) $(CH_2)_6N_4$, which reacts very rapidly with phosgene. Used in conjunction with sodium phenate, it will protect against phosgene at a concentration of 1:1,000 for a considerable period. An excess of sodium hydroxide is used with the sodium phenate, and a valve is provided in the helmet for the escape of exhaled air. The valve was originally devised so that the hydroxide would not be too rapidly carbonated, but it was found in addition that there is a great difference in ease of breathing and comfort if a valve is placed in the mask. The helmet is put on over the head, grasped with left hand around the neck and tucked into the jacket. This form is still used in reserve.

By this time gas shells were beginning to be used in large numbers, and it became evident that protection by a fabric could not be depended on with certainty. The box type of respirator was the next development. Respirators have to fulfill two requirements which are quite opposed to one another. In the first place they should be sufficiently large and elaborate to give full protection against any concentration of any gas, whereas military exigency requires that they be light and comfortable. It is necessary to strike a balance between these two. Upon a proper balance depends the usefulness of the respirator. Oxygen apparatus will not do on account of its weight and its limited life. Two hours' life is excessive for that type. The side that can first force the other to use oxygen respirators for protection has probably won the war.

The concentrations of gas usually met with are really very low. As has been said, a high concentration for a gas cloud is 1 part in 1,000, whereas concentrations of two or three per cent. can be met by respirators depending on chemical reactivity. One such respirator is a box of chemicals connected by a flexible tube with a face-piece fitting around the contours of the face, and provided with a mouthpiece and nosepiece.

As regards the chemicals used there is no secret, for the Germans have many of the same things. Active absorbent charcoal is one of the main reliances, and is another suggestion that we owe to the Russians. Wood charcoal was used in one of their devices and was effective, but most of the Russian soldiers had no protection at all.

We wanted to protect against chlorine, acids and acid-forming gases, phosgene, etc., and at one time were fearful of meeting large quantities of hydrocyanic (prussic) acid (HCN). At one period every prisoner taken talked about the use of prussic acid, saying that the Kaiser had decided to end the war and had given permission to use prussic acid. Protection was evidently needed against it. The three things that then seemed most important were: (1) chlorine and phosgene; (2) prussic acid; (3) lachrymators. Charcoal and alkaline permanganate will protect against nearly everything used, even up to concentrations of ten per cent. for short periods.

The German apparatus, developed about the same time, is of different pattern, and is still employed. It consists of a small drum, attached directly to the front of the face-piece, and weighs less than the British respirator but must be changed more frequently. It has no mouthpiece. The chemicals are in three layers: first an inside layer of pumice with hexamethylenetetramine, in the middle a layer of charcoal (sometimes blood charcoal), and outside baked earth soaked in potassium carbonate solution and coated with fine powdered charcoal.

As regards the future of the gas cloud, it may be looked upon as almost finished. There are so many conditions that have to be fulfilled in connection with it that its use is limited. It is very unlikely that the enemy will be able to spring another complete surprise with a gas cloud.

The case is different with gas shells. The gas shells are the most important of all methods of using gas on the Western Front, and are still in course of development. The enemy started using them soon after the first cloud attack. He began with the celebrated "tear" shells. A concentration of one part in a million of some of these lachrymators makes the eyes water severely. The original tear shells contained almost pure xylyl bromide or benzyl bromide, made by brominating the higher fractions of coal-tar distillates.

The German did his bromination rather badly. As you know, it should be done very carefully or much dibromide is produced, which is solid and inactive. Some of the shells contained as much as twenty per cent. dibromide, enough to make the liquid pasty and inactive. The shells used contain a lead lining, and have a partition across the shoulder, above which comes the T. N. T. and the fuse. These shells had little effect on the British, but one attack on the French, accompanied by a very heavy bombardment with tear shells, put them out badly. The eyes of the men were affected, and many of the men were even anesthetized by the gas, and were taken prisoner.

Our first big experience was an attack at Vermelles. The Germans put down a heavy barrage of these shells and made an infantry attack. The concentration was great, the gas went through the helmets, and the men even vomited inside their helmets. But it is difficult to put down a gas barrage, and there is danger that it will not be a technical success. In the instance cited certain roads were not cut off sufficiently, so that reinforcements got up. This attack, however, opened our eyes to the fact that, as in the case of gas clouds, concentration would be developed so as to make it high enough to produce the required effect under any circumstances.

When the Germans started using highly poisonous shells, which was at the Somme in 1916, they did not attend to this sufficiently, although enormous numbers of shell were used. The substance used was trichloromethyl-chloroformate, but not in great strength. It had no decided reaction on the eyes, hence the men were often caught.

The quantity of gas that can be sent over in shells is small. The average weight in a shell is not more than six pounds, whereas the German gas cylinders contain forty pounds of gas. To put over the same amount of gas as with gas clouds, say in five minutes per thousand yards of front, would require a prohibitive number of guns and shells. It becomes necessary to put the shells on definite targets, and this, fortunately, the Germans did not realize at the Somme, although they have found it out since.

The use of gas out of a projectile has a number of advantages over its use in a gas cloud. First, it is not so dependent on the wind. Again, the gunners have their ordinary job of shelling, and there is no such elaborate and unwelcome organization to put into the front trenches as is necessary for the cloud. Third, the targets are picked with all the accuracy of artillery fire. Fourth, the gas shells succeed with targets that are not accessible to high explosives or to gas clouds. Take, for instance, a field howitzer, dug into a pit with a certain amount of overhead cover for the men, who come in from behind the gun. The men are safe from splinters, and only a direct hit will put the gun out of action. But the gas will go in where the shell would not. It is certain to gas some of the men inside the emplacement. The crew of the gun must go on firing with gas masks on, and with depleted numbers. Thus it nearly puts the gun out of commission, reducing the number of shots say from two rounds a minute to a round in two minutes, and may even silence it entirely. Another example is a position on a hillside with dugouts at the back, just over the crest, or with a sunken road behind the slope. Almost absolute protection is afforded by the dugouts. The French tried three times to take such a position after preparation with high explosives, and each assault failed. Then they tried gas shells, and succeeded. The gas flows rapidly into such a dugout, especially if it has two or more doors.

Among the effective materials used by the Germans for gas shells were mono- and tri-chloromethyl-chloroformate. Prussic acid never appeared; the Germans rate it lower than phosgene in toxicity, and the reports concerning it were obviously meant merely to produce fear and distract the provisions for protection.

During the last five months the actual materials and the tactics used by the Germans have undergone a complete change. The lachrymator shells are less depended upon than formerly for "neutralization," but are still a source of annoyance. Mere annoyance, however, may be an effective method of neutralizing infantry. For instance, where large amounts of supplies and ammunition are being brought up there are always cross-roads where there is confusion and interference of traffic. A few gas shells placed there make every man put on his mask, and if it is a dark night and the roads are muddy, the resulting confusion can be only faintly imagined.

It may thus be possible to neutralize a part of the infantry by cutting down their supplies and ammunition.

The use of a gas shell to force a man to put on his mask is practically neutralization. If at the same time you can hurt him, so much the better. Hence the change in gas-shell tactics, which consists in replacing the purely lachrymatory substance by one that is also poisonous.

One substance used for this method of simultaneously harassing and seriously injuring was dichloro-diethysulphide (mustard gas). Its use was begun in July of last year at Ypres, and it was largely used again at Nieuport and Armentieres. A heavy bombardment of mustard-gas shells of all calibers was put on these towns, as many as 50,000 shells being fired in one night. The effects of mustard gas are those of a "super-lachrymator." It has a distinctive smell, rather like garlic than mustard. It has no immediate effect on the eyes, beyond a slight irritation. After several hours the eyes begin to swell and inflame and practically blister, causing intense pain, the nose discharges freely, and severe coughing and even vomiting ensue. Direct contact with the spray causes severe blistering of the skin, and the concentrated vapor penetrates through the clothing. The respirators of course do not protect against this blistering. The cases that went to the hospitals, however, were generally eye or lung cases, and blistering alone took back very few men. Many casualties were caused by the habit that some of the men had fallen into of letting the upper part of the mask hang down so as not to interfere with seeing. The Germans scored heavily in the use of this gas at first. It was another example of the element of surprise in using a new substance that produces new and unusual symptoms in the victims.

Up to the present time there has been no material brought out on either side that can be depended on to go through the other fellow's respirator. The casualties are due to surprise or to lack of training in the use of masks. The mask must be put on and adjusted within six seconds, which requires a considerable amount of preliminary training, if it is to be done under field conditions.

Among other surprises on the part of the Germans were phenylcarbylamine chloride, a lachrymator, and diphenylchloroarsine, or "sneezing gas." The latter is mixed in with high explosive shells or with other gas shells, or with shrapnel. It was intended to make a man sneeze so badly that when he puts on his mask he is not able to keep it on. The sneezing gas has, however, not been a very great success.

All bombardments now are of this mixed character. The shells used are marked with differently colored crosses, and definite programs are laid down for the use of the artillerymen.

As regards the future of gas shells, it should be emphasized that the "gas shell" is not necessarily a gas shell at all, but a liquid or solid shell, and it opens up the whole sphere of organic chemistry to be drawn upon for materials. The material placed inside the shell is transformed into vapor or fine droplets by the explosion and a proper adjustment between the bursting charge and the poisonous substance is necessary. Both sides are busy trying to find something that the others have not used, and both are trying to find a "colorless, odorless, and invisible" gas that is highly poisonous. It is within the realm of possibilities that the war will be finished, literally, in the chemical laboratory.

The Germans have not altered their type of respirator for some time, and it is not now equal in efficiency to the British or American respirator. The German respirator, even in its latest form, will break down at a concentration of 0.3 per cent. of certain substances. The German design has given more weight to military exigency, as against perfect protection, than has the British. Another thing that weighs against changes in design is the fact that the German, already handicapped by the lack of certain materials, must manufacture 40,000,000 respirators a year in order to supply his Austrian, Bulgarian, and Turkish allies, as well as his own army.

In the British and American armies the respirator must always be carried with the equipment when within twelve miles of the front. Between twelve and five miles a man may remove the respirator box in order to sleep, but within five miles he must wear it constantly. Within two miles it must be worn constantly in the "alert" position (slung and tied in front). When the alarm is given he must get the respirator on within six seconds. The American respirator is identical with the British. The French have a fabric mask made in several layers, the inner provided with a nickel salt to stop HCN, then a layer with hexamethylenetetramine; it has no valve and is hot to wear. The French also use a box respirator, consisting of a metal box slung on the back, with a tube connecting to the face mask; the latter is of good Para rubber and is provided with a valve. One disadvantage of this form is the danger of tearing the single rubber sheet. The German mask now contains no rubber except one washer; the elastic consist of springs inside a fabric, and the mask itself is of leather. It hardens and cracks after being wet, and is too dependent upon being well fitted to the face when made.

(The lecturer exhibited various types of gas shells, helmets, masks, and respirators.)

The following compounds have been used by the Germans in gas clouds or in shells:

1. Allyl-iso-thiocyanate (Allyl mustard oil), C_3H_5NCS (shell).
2. Benzyl bromide, $C_6H_5CH_2Br$ (shell).
3. Bromo-acetone, $CH_2Br \cdot CO \cdot CH_3$ (hand grenades).
4. Bromated methyl-ethyl-ketone (bromo-ketone), CH_2Br-COC_2H_5 or $CH_3 \cdot CO \cdot CHBr \cdot CH_3$ (shell). Dibromo-ketone, CH_3-$COCHBr \cdot CH_2Br$ (shell).
5. Bromine, Br_2 (hand grenades).
6. Chloro-acetone, $CH_2Cl \cdot COCH_3$ (hand grenades).
7. Chlorine, Cl_2 (cloud).
8. Chloromethyl-chloroformate (Palite), $ClCOOCH_2Cl$ (shell).
9. Nitro-trichloro-methane (chloropicrin or nitrochloroform), CCl_3NO_2 (shell).
10. Chlorosulphonic acid, $SO_3 \cdot H \cdot Cl$ (hand grenades and "smoke pots").
11. Dichloro-diethylsulphide (mustard gas), $(CH_2ClCH_2)_2S$ (shell).
12. Dimethyl sulphate, $(CH_3)_2SO_4$ (hand grenades).
13. Diphenyl-chloro-arsine, $(C_6H_5)_2AsCl$ (shell).
14. Dichloromethyl ether, $(CH_2Cl)_2O$ (shell).
15. Methyl-chlorosulphonate, CH_3ClSO_3 (hand grenades).
16. Phenyl-carbylamine chloride, $C_6H_5NCCl_2$ (shell).
17. Phosgene (carbonyl chloride), $COCl_2$ (cloud and shell).
18. Sulphur trioxide, SO_3 (hand grenades and shell).
19. Trichloromethyl-chloroformate (diphosgene, superpalite), $ClCOOCCl_3$ (shell).
20. Xylyl bromide (tolyl bromide), $CH_3C_6H_4CH_2Br$ (shell).

THE MANGANESE CONTENT OF THE ASH OF CERTAIN DRUGS.[1]

By L. E. Westman and R. M. Rowat, Ottawa, Canada.

Although the significance of the presence of manganese in plants and its relation to plant metabolism is not yet clear, the quantity of manganese observed to be present in the barks of certain laxative drugs and in other portions of plants used for similar purposes was considered by the authors to be worthy of general mention.

Hafner and Krist have pointed out in a qualitative way that a large number of drug plants contain manganese. They were able to obtain positive tests for manganese in 164 drugs listed in the Austrian Pharmacopœia, and were led to this investigation by the occurrence of a greenish color in the ash of many drugs. This color is formed when the ash is strongly heated in a muffle from the manganite salts present and is certainly most marked in many instances, especially those where an extract of the drug has been evaporated and ashed. This is due to the fact that only a small fraction of the lime salts present in plants is extracted by methods of percolation, and in the relative absence of these salts the manganese that is extracted becomes observable in the ash.

The method adopted by these authors in their tests was as follows: 3 to 4 Gm. samples of the drug were ashed and the ash dissolved in 8 to 10 Cc. of dilute nitric acid (free from hydrochloric acid), filtered if necessary, then heated, and after the addition of a small amount of brown, manganese-free lead peroxide, was brought to boiling. When manganese was present the liquid acquired a more or less intense purple-red color according to the amount. This reaction naturally fails in the presence of chlorides.

According to Pichard, the seeds of plants are quite rich in manganese, and Jadin and Astruc find that the aërial portions of plants contain more manganese than the subterranean. McHargue tabulates 51 determinations made on nuts, shells, seeds, and seed coatings, obtaining for his two highest results 0.04 per cent. manganese in dried potato peelings, and 0.09 per cent. in dried turnip tops. Manganese has been shown by Headden to be present in all samples of wheat examined in amounts from 0.004 to 0.007 per cent.

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[1] From *The Journal of the American Chemical Society.*

RESULTS AND DISCUSSION.

The results obtained are tabulated below and are calculated on the dry basis at 110°:

TABLE I.

Drug Examined.	Per Cent. of Manganese Present.	
Rhamnus Frangula (or alder buckthorn bark)	0.0242 to 0.0674	± 0.0003
Cinnamomum Cassia Cortex (or cassia bark)	0.0624	± 0.0003
Rhamnus Purshiana (cascara sagrada)	0.0137 to 0.0223	± 0.0003
Podophyllin (root)	0.0052	± 0.0002
Senna (leaves)	0.0043	± 0.0002
Rhubarb (root)	0.0036	± 0.0002
Rhamnus Californica (mature bark)	0.0033	± 0.0002
Licorice (root)	0.0026	± 0.0001
Jalap (root)	0.0024	± 0.0001
Euonymus Atropurpureus (wahoo bark)	0.0021	± 0.0001
Cassia pulp	0.0017	± 0.0001
Aloes (barbadoes)	0.0006	± 0.00005

From data available it would appear that both Rhamnus Frangula and cassia bark show a higher content of manganese than any other similar plant tissue previously examined. It was found that all samples of these barks did not show the same manganese content, and observed limits of the amounts present are given above. The lower numbers represent mature or thick bark, while the higher numbers were obtained from thinner bark. It is quite possible that an examination of specially selected bark would widen this range, but the work reported was carried out on various samples and it is thought that it covers the range fairly well. Factors involving the change of manganese content with the season have not, however, been studied. In an attempt to locate the cells or region of the bark giving the highest content of manganese, both inside and outside scrapings were examined. It was found for Rhamnus Purshiana that the concentration of manganese in the inner third of the bark was about double that present in the outer third. This may indeed be generally true and would go to show that although manganese is present in the outer layers of the bark it really functions more particularly in the inner layers where plant metabolism is more actively going on. The accidental presence of definite amounts of manganese in these barks cannot be accepted as an explanation, while the conception that a definite concentration of manganese is a factor in the normal metabolism of any particular species seems more probable. It is natural to expect that a plant using a higher concentration of manganese in certain working cells might leave behind in the older bark a higher uniform residue. In any case it seems evident that definite amounts of manganese may be found present in all or any of the different parts of plants.

MANGANESE FRACTION SOLUBLE IN WATER.

By methods of percolation, and by boiling the powdered barks in water, it was found that about one quarter of the total manganese present may be extracted from members of the Rhamnaceæ family by this means.

TABLE II.

Bark Examined.	Total Manganese in the Bark, Per Cent.	Manganese Extracted, Per Cent.
Rhamnus Frangula	0.0242	0.0058
Rhamnus Purshiana	0.0137	0.0029
Rhamnus Californica	0.0033	0.0008

The numbers are based on dry samples as above and are the average results of several good duplicate determinations, showing the uniformity with which manganese is extracted from such materials. Manganese thus extracted does not appear to have the properties of inorganic manganese and is not removed from these solutions by ordinary means. This at once leads to a new method for distinguishing between these closely related species and it follows from this that the development of a "Manganese Number" for commercial extracts of such drugs would seem to be a quite reasonable and practical method of procedure in their examination. It is our hope to develop such an application in the near future.

Method of Estimation.—The analytical work reported was accomplished by a simple application of the ammonium persulphate method for the determination of small amounts of manganese. The work was done in two ways, depending on the manganese found present by initial trials.

Wherever 10 Gm. samples are available, the following procedure may be recommended: If the presence of manganese is known to be of the order of 0.015 per cent. or higher, it is possible to titrate directly the permanganate formed with standard sodium arsenite solution. If the percentage is lower than this it is more feasible to compare the color developed with solutions of known permanganate content which have been carefully prepared and correspond with the unknown solution with regard to acidity and general ion concentration.

In cases of the first order of Manganese content, 10 Gm. samples of the well-ground materials were ashed in platinum in a muffle and 20 Cc. of pure concentrated sulphuric acid was added. The sample was then heated till the acid fumed freely in order to remove chlorides. It was then cooled and diluted with distilled water, washed out into a 500 Cc. beaker and diluted to at least 300 Cc. To this solution was added one Cc. of a silver nitrate solution (5 Gm. in 100 Cc.) and the whole warmed to about 80°. Approximately one Gm. of ammonium persulphate was gradually stirred into this solution, which was then heated on the steam bath as long as the color of the permanganate deepened. By check analyses the reaction was found generally to be complete at the end of 30 minutes. The solution was, however, heated 45 minutes and allowed to cool. When cold it was rapidly titrated with sodium arsenite solution which had been standardized against known amounts of permanganate developed in the same way. Unless the dilution is sufficient a brown hydrated form of manganese will separate out after the addition of the ammonium persulphate. Where the percentage of manganese is as high as 0.06 a volume of 500 Cc. is necessary when working on a 10 G. sample.

In cases where the manganese was of a lower order than 0.01 per cent. the color was developed as above from a 10 Gm. sample in a 200 Cc. volumetric flask and compared by means of a colorimeter with standard solutions of permanganate.

Our thanks are due to Dr. J. M. Francis, of the Parke Davis Co., Detroit, Mich., for kindly supplying us with genuine samples of some of the above materials.

Summary.—(1) The manganese content of certain laxative drugs has been measured along with allied species of plants.

(2) It has been found that for the family Rhamnaceæ the manganese is extracted in water proportionally to its total amount in the bark.

(3) A practical use of this determination is suggested leading to the establishment of a "Manganese Number" for extracts of these drugs.

THE USE OF BACTERIA IN THE PREPARATION OF NATURAL INDIGO.[1]

We have had occasion to refer to the promising work now in progress in India, to establish upon a genuine scientific basis the treatment of the indigo plant, for the transformation of the indican present into indigo. The advance thus far made by those in charge of this important investigation, Mr. Hutchinson, the bacteriologist, and Mr. Davies, the chemist, is outlined in a recent bulletin of the Pusa Research Institute, and is here briefly summarized:

The possibility of bacterial action was suggested by three facts. Firstly, the gas produced during the process of fermentation in the steeping vat varies in quantity and composition; secondly, chemical decomposition commences near the walls of the vat, and then spreads inwards, this suggesting that the presence of bacteria on the walls has something to do with the change; and, thirdly, there is a curious divergence in the yield, not only between different factories, but between vats of the same factory worked under apparently identical conditions, and in particular, when a new vat is brought into use it takes some days for it to reach the normal yield of the factory.

These observations suggested that the theory of transformation so far accepted, by which the main credit for the change was given to a constituent in the plant itself, was incomplete. The conversion of indican, the crude form of the dye, into indoxyl—which is subsequently converted into indigo by oxidation—appeared to depend in part on outside agencies, and laboratory researches showed this to be the case. It has now been established that bacterial action plays a considerable part in the process of change, being in fact essential to the extraction of the maximum yield of indigo. This is a discovery of great potential importance, for it at once supplies an explanation of, and promises a remedy to, the extraordinary differences in yield which occur in adjacent factories. In Bihar, for example, the variations are from one to several hundred per cent., and no satisfactory reason for their occurrence was previously advanced. It now appears to be certain that the high-yielding vats are equipped with a full stock of beneficial bacteria, while the low yielders are either inadequately stocked with these or contain actively hostile bacteria. Mr. Hutchinson has isolated the adverse bacteria, and also obtained pure cultures of several of the beneficent species, obtaining exact measurements of their indoxyl-producing powers. They exhibit considerable variation.

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[1] From *The Chemical Engineer.*

The introduction and propagation of friendly species can be effected in several ways. The steeping vats can be inoculated with pure cultures, or the multiplication of the beneficial organisms already present can be fostered by the provision of conditions favorable to their growth. Mr. Hutchinson believes that a combination of these two methods will prove the most satisfactory. At the same time the bacteria must be given fuller scope for their action. Being restricted to the walls and floor of the vat, their area of operations is limited, and if the vats are too large their productive powers fail to act on the more remote portions of the indican solution. It therefore appears desirable to adapt the vats so as to increase the ratio of wall surface to cubic contents. What the most efficient ratio is has still to be determined, but this is mainly a matter of experiment. It will certainly vary from factory to factory until the bacterial conditions are uniform. Again, the character of the wall surface is a factor of importance. A smooth cement wall is probably not the ideal surface, in which case a substitute has to be found. This also should soon be revealed by experiment. Once discovered, the practical benefits would be considerable, and quickly repay the producers for the necessary alterations.

ANDALUSIAN ESSENTIAL OILS.[1]

By Louis G. Dreyfus, Jr., Consul, Malaga, Spain.

The essential-oil industry is said to have been established in Malaga about twenty years ago. At first the production was on a small scale, but it has steadily increased; especially so since the outbreak of the European war, when the German production of cheaper extracts and essences was shut off.

There are two modern steam distilleries at Malaga, with experienced chemists in charge of the works; one of these is a German firm and the other is Belgian. Another steam distillery is located at Jaen. There are also hundreds of small producers scattered throughout Malaga, Jaen, and Granada Provinces, with direct-fire stills holding from 100 to 500 pounds of plant. The product of these small establishments is not so good as that of the steam distilleries. Furthermore, instead of three fourths of a pound of essential oil from 100 pounds of plant, less than one half pound is recovered in these country stills.

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[1] From *Commerce Reports.*

Many of the country producers are furnished with stills by the large essential-oil dealers under an arrangement whereby the product turned out by them is to be sold, at previously contracted prices, exclusively to the dealer who supplied the still.

Spain Said to Lead World in Production.—While there are no definite statistics available on this subject Spain is said to lead the world in the production of spike, rosemary, thyme, sage, pennyroyal, and the finest quality of geranium rose oil. Although practically no herbs or plants for the production of essential oils are cultivated, raw materials are readily obtainable in the mountains, and the distilleries are able to operate all through the year. The full season for sage is May and June; for thyme and rosemary, July and August; for fennel, spike, and lavender, September and October. During the winter, when the plants are scarcest, the large distilleries devote themselves to redistillation.

In this part of Spain the actual plant or its leaves and not the flowers are distilled in making essential oils. The probable reason for this is that the air is so charged with salt that the perfume of the flowers is destroyed.

Spanish essential oils are used in the preparation of perfumery, soap, medicine, spirits, and for the adulteration of other essential oils and spirits. Spike is used to adulterate the much finer lavender. The local juniper is employed in the adulteration of the finer French, Belgian, and Dutch juniper. An internal-revenue tax is levied upon distilled anise. It is said that oil of fennel, upon which there is no tax, is used to adulterate the anise. Geranium rose oil is used in the adulteration of rose oil.

Gathering the Plants.—Men, women, and children scour the mountains to cut the plants from which the essential oils are made. The plants are gathered into bunches, loaded onto the backs of donkeys, and brought directly to the place selected for the distillation. The lavender plant is too fragile to be transported any great distance and must be distilled where it actually grows. Consequently, if any of the factories desire to produce lavender oil, they must send a portable still to the scene of operations. In the lavender season the Sociedad Santiago sends a small steam still, with a capacity of 100 gallons, operated by a traction engine, into the country.

The prices paid for the various plants and berries to be used for distillation vary considerably. The present price of most of them ranges from 1.20 to 1.80 pesetas per 100 pounds delivered at the place of distillation. Cultivated herbs, such as the geranium, bring a higher price. Juniper berries cost 12 pesetas per 100 pounds.

The Process of Manufacture.—In Andalusia the aromatic plants are not dried before distillation, but are used as they come from the country. They are placed in the distillery vats; steam is then introduced from the botton, so that it diffuses evenly and forces upward through the plants; the heat of the steam expands the globules of oil which are contained in the minute cells of the leaves, causing them to burst. The oil thus freed is carried off in the current of steam. The steam charged with the essential oil, having passed through the plants to the top of the vat, escapes through a valve to the primary condenser, which consists of a serpentine copper coil over which cold water flows. The distillate after traversing this worm falls into a receiver having an exterior pipe leading from the bottom to a height nearly equal to that of the receptacle. As the distillate flows into the receiver, the water, being heavier than the oil, sinks to the bottom of the vessel and is forced out through the discharge pipe.

In some countries this water, which does not throw off the entire amount of essential oil contained, is returned to the boiler and reconverted into steam and continuously used. This system is employed in the Malaga district only in the preparation of rose oil. The essential oil collects upon the top until the tank is filled. The whole process takes about three hours. As thus distilled from the plants the product obtained is the natural oil, which always contain an insoluble resin. It is in this form that the oil is usually sold.

Vacuum System of Refining Used.—Prices.—To give the oil the greatest possible concentration, aroma, and solubility and to free it from foreign substances, it is treated by the vacuum process. The old style was to repeat the process of distillation described above. The newer vacuum system is much superior because the oil boils at a much lower temperature, which prevents the decomposition of the oil. The system employed is identical with the first distillation except that the natural oil instead of the plant is placed in the vat for distillation and, furthermore, a vacuum is maintained in the vat and coil. The duration of the refining process depends upon the quantity of oil to be distilled. After the aromatic oil has been recovered there remains an oleoresin which is thrown away. This is sometimes found to the extent of over 25 per cent. The refined essential oil has the true plant odor in a high degree, is of the greatest strength, unusual solubility, brilliant and limpid, and is absolutely pure.

Increased Shipments to America.—Statistics of the total production of essential oils in this district or of the total exports of such oils from Malaga are not available. However, the following statement, giving in dollars the exports to the United States from 1898 to date, indicates the rapid growth of the industry (the increase of the exports to the United States since the outbreak of the war is worthy of note): In 1898, $179; in 1899, $565; in 1900, none; in 1901, $669; in 1902, $502; in 1903, none; in 1904, none; in 1905, $5,455; in 1906, none; in 1907, $1,231; in 1908, $3,902; in 1909, $3,646; in 1910, $10,445; in 1911, $23,940; in 1912, $72,034; in 1913, $76,966; in 1914, $83,773; in 1915, $137,129; in 1916, $176,164; and in the first nine months of 1917, $200,329.

The total American imports from all countries of essential oils of the classes shipped from Malaga are shown in the table which follows, the figures representing the American imports for consumption of the oils named during the fiscal years ending June 30, 1915, and 1916:

Oils.	Year ended June 30	
	1915.	1916.
Fennel	$ 441	$ 789
Juniper	7,637	1.988
Lavender and spike lavender	117.039	271,815
Origanum	15,111	24,291
Rosemary	44,636	30,504
Thyme	88,498	85,913
Totals of oils named	$273,362	$415,300

By comparing the above with the declared exports of essential oils from Malaga, the great importance of the local supply of these oils will be noted. It is said that the large quantity of rosemary oil imported into the United States is for the denaturing of olive oils at the customhouse, to make them unfit for any but industrial purposes, in which case they are admitted duty free. Large quantities of thyme are now used in America for the extraction of the phenol therein contained. This latter product has become very scarce since the outbreak of the war, because of the curtailment of the export from certain belligerent countries.

WOOD ALCOHOL POISONING.[1]

By A. O. Gettler, Ph.D., and A. V. St. George, M.D.

The prohibition by our government of the manufacture of distilled liquors will unquestionably lead to much "moonshining," adulteration and dilutions of liquors offered to the public. That such is the case, even at this period of the war, is quite evident from the recent poisoning in this city of over thirty persons, six of whom died, with a whisky sold in one of the poorer sections of the city that on analysis proved to contain a considerable amount of wood (methyl) alcohol. Believing that similar cases will occur and with increasing frequency, despite the vigilance of our revenue and state officers, we feel it timely again to warn physicians, coroners and health officers, in order that they may be on their guard in similar cases, as prompt and efficient therapeutic measures must be instituted to hold any hope for recovery of the patient, and furthermore, to detect any violations of the food laws.

It is our belief that the introduction into beverages of the dangerous poison, wood alcohol, is nearly always due to ignorance on the part of the blender. Many physicians and nearly all of the lay public are unacquainted with the chemical and physiologic differences between the relatively innocuous ethyl or grain alcohol and the dangerous methyl or wood alcohol when applied to the body or introduced into it. The refined wood alcohol tastes like ethyl alcohol, and, moreover, is considerably cheaper; hence the adulterator buys the latter, ignorant that severe poisoning, blindness and often death lurk within it.

The pharmacology of this poison has been presented by Pohl and Hunt, and we would refer the reader to their original papers. The violation of the food law and the criminal aspects of our cases are being investigated by the proper authorities, and we shall merely record the findings in the six fatal cases, with points in diagnosis and treatment and methods for detecting the poison.

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[1] Reprinted from the *Journal of the American Medical Association.*

Similar but meager histories were obtained, and we were unable to determine the quantities of the poison taken. Four of the patients were admitted to St. Vincent's Hospital, one to Bellevue Hospital, and one patient died in his own home. All had taken whisky a short time previously, and all had complained of violent abdominal pains, incessant vomiting and extreme weakness. Three of the patients complained of blindness. Three of the St. Vincent's patients and the Bellevue patient came into the hospitals in coma; one (Case 1), who was admitted while conscious, said that he had taken whiskey a short time before; soon thereafter he noted intense abdominal pain, vomiting, increasing weakness and dimness of vision; finally he collapsed in the street, and was brought to the hospital, where he died half an hour after admission. The patient had the appearance of being in a severe toxic condition or collapse. The important points in all the physical examinations were slow respirations, dilated pupils, weak and rapid heart action, cold and clammy extremities, and deep coma.

In Case 1, stomach washings were obtained, and also some of the liquor that he had drunk. Both were found to contain wood alcohol.

The examination of the urine during life in Case 2 revealed albumin and casts, and gave a Fehling reduction (aldehyd formation?).

The diagnostic features of the acute type of poisoning are extreme physical weakness, acute gastro-intestinal symptoms, blindness, and deep and prolonged coma, ending in death with cardiac collapse. In the chronic type of cases, blindness is the chief symptom.

A differential diagnosis from epilepsy, and especially all types of coma—uremia, cardiac, diabetic, cerebral, toxic and traumatic—must be made. This frequently is very difficult; but if we bear in mind the important symptoms mentioned above, and obtain a history of whisky drinking, together with an alcoholic breath, we should be suspicious, at least to the extent that we are dealing with some form of alcohol poisoning.

The treatment, to be at all efficacious, must be promptly instituted, and consists essentially of ridding the body of the poison, and supportive measures. The poison is but slowly and incompletely oxidized in the body to more dangerous poisons, namely, formaldehyde and formic acid, and as such very slowly (for four to five days, and even longer) eliminated by the kidneys. Mayer has demonstrated that the relative toxicity of formic acid is six times greater that that of wood alcohol. For a considerable period of time, the alcohol is excreted unchanged into the stomach and intestine (Bongers), and it is therefore important that early and frequent gastric and rectal lavage be carried out. The stomach washings should be immediately examined for wood alcohol. Intravenous saline or sodium bicarbonate infusions and phlebotomy and transfusions, if the latter can be had quickly, should be administered. In addition, warmth and strong stimulation with strychnine, digitalis, caffeine, camphor, epinephrine, and oxygen must be given. It is said that ethyl alcohol is indicated to replace the methyl, and that it acts as a powerful stimulant; but we doubt this. For the treatment of the chronic form of poisoning, we refer the reader to the article by Buller and Wood, who collected the histories of 275 American cases up to 1904, and to Birch-Hirshfield, who discusses the eye condition in considerable detail.

The postmortems in Cases 1 to 4 were performed by Dr. Otto H. Schultze, and in Cases 5 and 6 by Dr. A. V. St. George, in the presence of Dr. Benjamin Schwartz, coroner's physician. The gross anatomic diagnosis in all the cases were: marked congestion with increased cerebrospinal fluid; marked congestion of all the viscera, and acute pulmonary edema and congestion. In addition, in all cases except Case 2, only dark fluid blood was distributed throughout the heart and vessels. In Case 2 there was an aortic stenosis, and a soft red clot was present in the left heart. The brain in Cases 1 and 5 had a suspicious odor, not, however, distinctive of alcohol; no odor could be detected in the stomach or its contents.

Results of Tests.

	Reduced fuchsin		Casein test		Resorcin test	
	Before	After	Before	After	Before	After
	Oxidation		Oxidation		Oxidation	
Case 1, brain	−	+	−	+	−	+
Case 1, lavage	−	+	−	+	−	+
Case 1, beverage	−	+	−	+	−	+
Case 2, brain	−	+	−	+	−	+
Case 3, brain	−	+	−	+	−	+
Case 4, brain	−	+	−	+	−	+
Case 5, brain	−	+	−	+	−	+
Case 5, urine 220 Cc.	−	+	−	+	−	+
Case 5, blood 490 Cc.	−	+	−	+	−	+

In case 6 there was, in addition, a chronic pulmonary tuberculosis. In Case 5 there was marked parenchymatous degeneration of the kidneys and liver. Microscopic section of heart, kidney and liver did not show an increased amount of fat. Pohl reported that he found an increase in the amount of fat in the liver. Sections of the optic, vagus and phrenic nerves show marked degeneration of these structures. Parts of the brain in all of the six cases were examined chemically according to the method given below. We selected the brain tissue for the performance of our tests, because of the assumption that the poison has a selective action on nerve tissue, as is indirectly proved by the blindness and deep coma.

Chemical Analysis of Brain.—The sample was finely ground, and water was added to make a thin suspension; it was placed in a distillation flask; 3 drops of liquid petrolatum were added to prevent frothing; it was acidified with tartaric acid and distilled with steam. Thirty Cc. of the distillate were collected. Of this, 5 Cc. were placed in a test tube and oxidized by the plunging of a red hot copper spiral into it six or eight times. This oxidation is for the purpose of converting the methyl alcohol to formaldehyde.

The oxidized material as well as a little of the original distillate was tested by the following three methods:

Reduced Fuchsin Test.—To 2 Cc. of each of the distillates (both oxidized and nonoxidized), 3 drops of (colorless) reduced fuchsin were added. A red color develops if an aldehyd is present. This test is not specific for formaldehyde, but is given by the aldehyd group in general.

Casein Test.—To 2 Cc. of each of the distillates (both oxidized and nonozidized), an equal amount of milk, then an equal volume of hydrochloric acid, and 2 drops of ferric chloride are added. This is brought to a boil. If formaldehyde is present, a violet to red color develops. This test is specific for formaldehyde and is very delicate, detecting formaldehyde in dilutions of 1:250,000.

Resorcin Test.—To 2 Cc. of each of the distillates (both oxidized and nonoxidized), a few drops of 0.5 per cent. resorcin are added, and stratified on sulphuric acid. In the presence of formaldehyde a red ring develops. This test is specific for formaldehyde.

The brain in every one of the six cases was found to have methyl alcohol present. The tests before oxidation were negative, showing that no oxidation to aldehyd occurred in the brain.

In Case 5, blood and urine also were available. These were examined according to the method given; both the blood (490 Cc. of blood being used) and the urine (220 Cc.) showed methyl alcohol but no formaldehyde.

It is important to note that the refined wood alcohol, in addition to being used as a diluent of whisky, is frequently used in the preparation of essence of peppermint, Jamaica ginger, lemon extract, punch, cologne, liniments, Florida water, bay rum, witch hazel and in the arts in lacquers, varnishes, etc.

CONCLUSIONS.

Physicians and health officers should warn the public of the dangers existing in the preparations of the kind enumerated above when applied to or introduced directly or by inhalation into the body. European authorities have shown that the denatured ethyl alcohol serves every purpose in medicine and in the arts as well as wood alcohol or better. We suggest, therefore, that legislation be enacted bringing about the prohibition of the sale of wood alcohol for domestic purposes, similar to laws now obtaining in England and Germany.

BARIUM SULPHATE FOR X-RAY WORK.[1]

The use of pure barium sulphate for X-ray work has already been referred to (see *Prescriber,* 1917, Feb., p. 52). It is inexpensive, being much cheaper than bismuth, it is opaque to the rays, and if perfectly pure there is no danger of toxicity. The drawback is its density and consequent tendency to fall to the bottom when suspended in any liquid or semi-liquid medium.

A formula for a barium meal is given in the B. P. Codex as follows:

Barium sulphate	150 Gm.
Corn flour	15 Gm.
Sugar	15 Gm.
Cocoa	20 Gm.
Water	500 Mils.

These ingredients are to be boiled together, and if the mixture is properly made the barium salt is well diffused, and there is little or no risk of it forming a deposit in the stomach or bowel.

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[1] From *The Prescriber.*

R. Bensaude and M. Terrey (*Presse medicale,* 1917, 25, 168; Mar. 22) recommend a gelatin cream containing 50 per cent. of barium sulphate; this can, they say, be kept without any tendency to precipitation for a long time. The preparation of the sulphate requires great care, beginning with pure recrystallized barium chloride, which is precipitated completely with excess of sodium sulphate; the precipitate is then washed many times to eliminate every trace of chloride. Incorporated with a gelatin medium it forms a velvety cream in which the barium salt is so finely suspended that it deposits very slowly indeed. An emulsion containing 200 Gm. of this cream, 40 Gm. of syrup of acacia, and distilled water to 250 Mils., may me made without trouble, and is stable for several hours. A more stable emulsion may be made from 200 Gm. of the barium-gelatin cream, with tragacanth, 5 Gm.; acacia, 2 Gm.; glycerin, 40 Gm.; and water to one liter. This mixture can be sterilized and when a deposit forms upon keeping, it is at once diffused by agitation. A barium meal may be prepared by mixing barium-gelatin cream, 200 Gm.; with powdered soluble chocolate, 50 Gm.; powdered agar, 10 Gm.; and boiling water, 150 Mils. Very good results are reported from this preparation.

THE ESTIMATION OF "WOODY-FIBER" IN FEEDING-STUFFS.[1]

By J. A. Voelcker and E. W. Voelcker.

It is very desirable that in an "empirical" method of analysis such as is involved in the estimation of woody-fiber there should be agreement as to the strengths of acid and alkali used in the process. In this country the leading agricultural analysts, following the method adopted by the late Dr. Augustus Voelcker, F.R.S., use 2 per cent. solutions of sulphuric acid and caustic alkali for the hydrolysis. The American and Continental official methods, however, prescribe solutions of the strength of 1.25 per cent. only, and, owing to the unfortunate tendency in this country to favor the adoption of foreign methods of analysis, these find their way into textbooks and are liable to be regarded as "official" here. In the case of such feeding-stuffs as the cereal grains and their offals, variations within limits of the strength of acid and alkali used do not materially affect the results obtained; but with oil cakes, especially those made from seeds, with a more or less hard "husk," very wide differences in results may arise, according as to whether 1.25 or 2 per cent. acid and alkali have been employed. In the case, for example, of palm nut and similar cakes it is impossible to properly effect the hydrolysis with the weaker solutions, and even with the 2 per cent. solutions vigorous boiling for half an hour is essential. It is best to operate on the material after extraction of the oil with ether. Three grammes of the ground sample are extracted with ether and then boiled vigorously for half an hour with 125 Cc. of 2 per cent. sulphuric acid, the volume of the liquid being kept constant during the operation. The liquid is diluted to 400 or 500 Cc. with water, and allowed to settle. The liquid is then poured through a filter—preferably a piece of fine linen—the residue is washed on to this, and then transferred to the original boiling vessel, and boiled for half an hour with 125 Cc. of 2 per cent. caustic alkali solution. The liquid is diluted as before, allowed to settle, and the insoluble fiber collected, either on a counterpoised filter or on the linen filter, from which it can readily be completely removed. The fiber is washed to free it from alkali, then treated with a little dilute acid, followed by water, and finally with alcohol. The fiber is dried at 100° C. to constant weight, and burnt, any mineral matter found being deducted from the weight of the fiber.

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[1] From *The Analyst.*

SELECTED PHARMACEUTICAL FORMULAS FROM THE CHEMIST'S CALENDAR.

(Continued from Page 207.)

Foot-Liquid.

Liquid formaldehydi	℥ixss
Sp. rosmarini	℥ss

A teaspoonful to a basin of water.

Very good for hardening the feet and healing blisters. Much appreciated in Army circles.

Acid Aperient Mixture.

Magnesii sulphat.	℥iij
Acid. sulph. dil.	ʒiij
Syrup. aurantii	℥iss
Aq. menth. pip. ad	Oj

Dose: A dessertspoonful or a tablespoonful with water twice or thrice daily.

For Perspiring Hands.

Lotion acid carbolic. (1 in 40)	℥v
Liq. formaldehyd.	ʒss
Acid. acetic.	ʒj
Ess. Parma violet	ʒj
Aq. dest. ad	℥vj

To be well rubbed into the palms of the hands and between the fingers several times daily.

Dry Shampoo for Hair.

Orris powder	ʒij
Rice-flour	℥i, ʒvj
Coumarin	Gr. ij

Mix intimately.

To be sprinkled among the hair and brushed off with a clean brush, prolonging the draw of the brush to the end of the hairs.

This resembles the best type of dry shampoo, and proves satisfactory. More complex formulas do not appear to afford better results.

Liquid Dry Shampoo.

Saponis dur.	ʒj
Spirit. meth. (industrial)	℥viij
Aq. destill.	℥iij

Macerate for three or four days, filter and add:

Liq. ammoniæ	℥j
Sp. rosmar.	℥ss

To be sprinkled over the hair, brushed through, and then rubbed off with a dry towel.

Reported to be very refreshing after a hot day, and to leave the hair "just nice."

Bath-Liquid.

Liquid ammoniæ	℥j
Liq. extract. quillaiæ	℥iss
Synthetic bergamot	ʒss
Synthetic musk	Gr. ijj
Aq. ad	℥iv

To be added to a bath. Softens the water, promotes a fine lather, and scents the skin. In favor among ladies. The perfume can be varied to suit individual preference.

BATH OR TOILET AMMONIA.

Saponis communis	Gr. viij
Liq. ammon. fort.	℥vj
Sp. lavand.	ʒij
Aq. dest. ad	℥xx

About a wineglassful to a bath; about a dessertspoonful to a toilet-basin.

Renders washing pleasant when the water is hard; with soft water it is stimulating. The scent can be varied or increased; an equivalent quantity of ess. of sweet-pea or ess. of Parma violet makes an agreeable change.

SUNBURN-LOTION.

Blanched almonds	ʒj
Borax	Gr. xx
Simp. tincture of benzoin	♏L
Orange-flower water	℥iiss
Sol. of hydrogen peroxide	℥ss

Bruise the almonds and triturate with successive portions of the orange-flower water in which the borax has previously been dissolved; strain through muslin, and add the tincture of benzoin and the solution of hydrogen peroxide.

Good as a protective before going out or as a cooling application on return.

SUNBURN CREAM.

Adipis lanæ hydros.	ʒj
Paraffin. liq.	ʒij
Liq. hydrog. perox.	ʒiij
Synthetic otto	Gtt. v

Mix the lanoline and liquid paraffin together in a warm mortar, incorporate the solution of hydrogen peroxide, and finally add the otto.

Makes a very nice toilet lanoline to send out in pots. Should be used sparingly and well rubbed in.

POISON FOR RATS AND MICE.

Barium carbonate	℥iv
Biscuit-flour	℥iij
Oatmeal	℥j
Oil of anise	♏v
Synthetic musk	Gr. j

Beef dripping sufficient to make a paste.

Very effective, and does not contain a scheduled poison. Pieces the size of a bean can be laid in holes and runs.

A few pieces of naphthaline placed in mouse-holes in a house have the effect of causing the little rodents to abandon their quarters.

WORM-BALL FOR DOG.

Pulv. arecæ	Gr. xxx
Pulv. santonin.	Gr. ij
Pulv. tragacanth.	Gr. j

Syrup. glucosi q. s. to form a bolus of pill consistence.

This is a suitable dose for a dog of 15 or 20 lb. in weight.

QUININE HAIR-TONIC.

Quin. hydrochlor.	ʒj
Cudbear	Gr. xx
Aq. chlorof.	℥xx
Aq. rosæ	℥xl
Glycerin	℥j

Macerate for four days, shaking twice daily, and filter.

To be sprinkled on the scalp and rubbed in every morning.

SHAMPOO POWDER.

Pulv. saponis	℥x
Pulv. sodii carb. com. exsiccat.	℥ij
Pulv. boracis	℥ij
Synthetic otto	ʒss
Synthetic musk	Gr. v

About a third of an ounce is sufficient to put up for one shampoo. Should for use be dissolved in a pint or so of warm water, and this solution used to soak the hair and get up a froth.

CASEIN NERVE-FOOD.

Sodium glycerophosph.	Gr. ij
Casein	ʒiss, Gr. viij

Powder the sodium glycerophosphate and mix lightly with the casein.

Dose: One or two teaspoonfuls at mealtimes.

CHILBLAIN-PAINT.

Menthol	ʒij
Ol. ricini	Gr. xv
Acid. tannic.	ʒj
Sp. rect.	℥ij

To be painted over the chilblains morning and evening, and more frequently when itching.

FOR BROKEN CHILBLAINS.

Phenol	Gr. xl
Ung. acid. boric., B.P. 1898	℥iij, ʒiij, Gr. xl
Zinci oxid.	℥ss

Make a smooth ointment.

To be applied on lint or linen. The dressing to be changed night and morning. Once a day dribble hot carbolic lotion, 1 in 60, from a height onto the sore before applying a new dressing.

ASTHMA POWDER.

Pulv. fol. stramonii,	
Pulv. potass. nitratis,	
Pulv. fruct. anisi	partes æquales

Dry each separately and mix intimately. About as much as will lift on a shilling made into a little cone and ignited gives off a smoke, which is to be inhaled when an attack is imminent or has come on.

INHALATION FOR COLD IN THE HEAD.

Menthol	ʒss
Ol. pini	♏xx
Acid. benzoic.	Gr. xx
Pulv. benzoin.	ʒij
Kieselguhr	℥ss

Mix intimately.

Half a teaspoonful of this in a jug with half a pint of hot water makes a very pleasant and useful inhalation.

TOOTHACHE-ESSENCE.

Menthol	ʒj, Gr. xx
Tinct. pyrethri	℥j
Tinct. hyoscy.	℥j
Tinct. bellad.	℥ss
Sp. rect.	℥iij

To be rubbed on the gum over the ache, or placed in any cavity there may be.

LIP-SALVE.

White beeswax	2 Oz.
Spermaceti	1 Oz.
Sesame oil	4 Oz.
Honey	2 Oz.
Oil of bergamot	120 Min.

Melt the wax and spermaceti, add the honey, and heat together; then gradually pour in the oils, and stir until cold. May be colored with alkanet or vermilion.

OXYGEN SKIN-LOTION.

Zinc oxide	120 Gr.
Powdered tragacanth.	30 Gr.
Glycerin or honey	1 Oz.
Ess. white rose	120 Min.
Solution of hydrogen peroxide	2 Oz.
Distilled water to	12 Oz.

Stir the tragacanth into the essence, add quickly 4 Oz. of the water, and then the remainder. Triturate well the zinc oxide with the glycerin, incorporate gradually the tragacanth mucilage, and finally the solution of hydrogen peroxide.

This is smeared over the neck and shoulders at night and allowed to remain on over night. Used for several consecutive nights it improves the appearance of the skin for evening dress.

DISINFECTION WITH FORMALDEHYDE. A SUBSTITUTE FOR THE PERMANGANATE–FORMALIN METHOD.[1]

By C. G. Storm.

The method proposed by H. D. Evans and J. P. Russell in 1904[2] for the rapid liberation of formaldehyde gas from its water solution, the "formalin" of commerce, in a condition suitable for practical disinfection, has been found by numerous investigators to be superior to most of the other known methods of formaldehyde disinfection, as regards simplicity, rapidity, cost and efficiency. This method consists in pouring the formalin quickly upon crystals of potassium permanganate contained in any suitable metallic vessel (for example, a water bucket), the oxidation of a part of the formaldehyde furnishing sufficient heat to cause rapid evaporation of the remainder of the formaldehyde together with the water.

The permanganate method has found very general application and is widely used in this country in practical disinfection work. Its use has, however, received a serious set-back by reason of the present scarcity of potassium permanganate and the resulting excessive cost of this chemical. Prior to the war in Europe, potassium permanganate was obtainable in this country at prices ranging usually from 9 to 10 cents per lb. It is now obtainable only at many times its former price, having held at approximately $4.00 to $4.25 per lb. for the past six months.

This fact has impressed the writer with the desirability of publishing a note regarding an analogous method for generating formaldehyde, devised by him in October, 1911, which it is believed has never been proposed for practical use, which preliminary tests indicate to be safer, as rapid, and almost as simple of operation, and which will be much less expensive, owing to the relatively low price of the material used.

The new method depends upon the action between the water solution of formaldehyde and a soluble chlorate, and is apparently analogous to the permanganate method, in that the oxidation of a part of the formaldehyde furnishes a sudden evolution of heat which serves to vaporize the remainder of the formaldehyde. It was suggested to the writer in the course of analysis of a potassium chlorate explosive. On adding formalin to the water solution of the explosive and heating the mixture, a violent evolution of gas resulted, increasing in intensity even after the tube containing the mixture was removed from the flame of the burner. The gas evolved was largely formaldehyde, apparently liberated from its solution by the heat generated in the oxidation of a part of the formaldehyde by the chlorate.

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[1] Reprinted from *The Journal of Industrial and Engineering Chemistry*, February, 1918.

[2] H. D. Evans and J. P. Russell, "Formaldehyde Disinfection," *13th Ann. Rept.*, State Board of Health of Maine, and *J. Am. Chem. Soc.*, 27 (1905), 714. See also Daniel Base, "Formaldehyde Disinfection," *J. Am. Chem. Soc.*, 28 (1906), 964–96.

An examination of the solution remaining after the reaction had subsided showed the presence of large amounts of chloride which had resulted from reduction of the chlorate. Repeated trials showed that the violent evolution of gas resulted only from concentrated solutions, but that the reduction of the chlorate to chloride, with a corresponding oxidation of formaldehyde, took place even in the case of very dilute solutions of chlorate. It has been demonstrated that under proper conditions this reaction is quantitative, and the results of the study of this quantitative method for determining chlorates will shortly be published.

The object of this paper is merely to call attention to what it is hoped will be a satisfactory substitute for the permanganate method of disinfection, and to offer an opportunity for a more complete study of the method, the writer's investigation having necessarily been quite incomplete because of lack of time and facilities for conducting work of this nature.

Potassium permanganate reacts immediately on coming in contact with formalin at ordinary temperatures, and if the permanganate is finely powdered instead of crystalline, the reaction may be violently explosive in character.[3] If formalin is poured on crystals of sodium or potassium chlorate, no action results until the mixture is warmed by application of external heat to about 65° C. This may be considered as a disadvantage, but as a matter of fact the reaction may be started with very little difficulty. The chlorate and formalin are placed together in a suitable metal container, such as a water bucket, of sufficient size to prevent the reaction mixture from foaming over, and the bucket, properly weighted so it will not float, placed in a large shallow pan (an ordinary dish pan will answer the purpose) containing water heated to about the boiling point.

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[3] G. B. Frankforter and R. M. West, *J. Am. Chem. Soc.*, 28 (1906), 1234.

The mixture becomes heated to the reaction temperature in a few minutes, when bubbles of gas begin to be evolved, this evolution increasing rapidly until it is so violent that the mixture may foam over the top of the bucket. The action is completed in 2 or 3 min., and with the proper proportion of chlorate and formalin the residue remaining in the bucket is practically dry and consists chiefly of chloride together with some unreduced chlorate.

Sodium chlorate seems to give just as satisfactory results as potassium chlorate, and has the distinct advantage of costing less than one half as much as the latter. Potassium chlorate is now quoted at 50 to 55 cents per lb., while sodium chlorate is listed at 24 to 25 cents.

Several investigators have attempted to determine what proportion of formaldehyde used in the permanganate process is liberated as gas and what proportion is oxidized by the reaction. Frankforter and West[4] obtained an evolution of 62 per cent. to 75 per cent. of the formaldehyde from formalin by this process in a long series of experiments under laboratory conditions, using glass apparatus and absorbing the evolved gas in water, the strength of the resulting solution being determined. D. Base,[5] in experiments with the process on a practical scale, used a specially prepared room of 2,000 cu. ft. capacity, determining the amount of formaldehyde gas in the room by drawing 5- to 10-liter samples through standard KCN solution, adding excess of standard $AgNO_3$ solution and titrating the excess of the latter with sulphocyanate. Base found that not over 40 per cent. of the total amount of formaldehyde used as formalin was evolved in the state of gas in the room.

It has been suggested that the reaction between formaldehyde and potassium permanganate is probably as follows:

$$4KMnO_4 + 3HCHO + H_2O = 4Mn(OH)_2 + 2K_2CO_3 + CO_2.$$

It is, however, likely that other reactions proceed at the same time, in which part of the formaldehyde is oxidized to formic acid. Assuming this reaction, however, it is calculated that with the proportions recommended by Evans and Russell (100 Cc. of 40 per cent. formalin to 37.5 Gm. $KMnO_4$) 5.34 Gm. of formaldehyde, or about

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[4] *J. Am. Chem. Soc.*, 28 (1906), 1234.

[5] *Ibid.*, 28 (1906), 964.

13.35 per cent. of the formalin, would be oxidized by the $KMnO_4$. With the proportions recommended by Base (100 Cc. of formalin to 50 Gm. $KMnO_4$) 7.12 Gm. HCHO or 17.8 per cent. of the formalin would be destroyed. These figures are considerably lower than those found in the investigations mentioned above. In any event it is apparent that in the permanganate process a considerable part of the formaldehyde used as formalin is destroyed by oxidation, the reaction supplying the heat which causes the rapid volatilization of the remainder.

It may be assumed that the behavior of the chlorate with the formalin is entirely analogous to that of the permanganate, and that the reaction occurs according to the equation

$$2KClO_3 + 3HCHO = 2KCl + 3H_2O + 3CO_2.$$

Experiments have shown that the proportion of 25 Gm. of chlorate to 100 Cc. of formalin is approximately the one giving best results, that is, with these proportions there is practically no liquid left in the residue after the reaction subsides, the formaldehyde being either driven off as gas or oxidized and the water evaporated at the same time.

A simple calculation shows that, according to the above reaction, 25 Gm. $KClO_3$ will theoretically oxidize 9.18 Gm. HCHO or nearly 23 per cent. of the formaldehyde in the 100 Cc. of formalin, leaving the remaining 17 per cent. to be volatilized. It is probable, however, that other reactions occur, such as

$$KClO_3 + 3HCHO = KCl + 3HCOOH.$$

In fact, appreciable amounts of formic acid, as well as CO_2, are evolved by the reaction of formalin with either permanganate or chlorate.

In an attempt to determine in a simple manner the best proportions of formalin and chlorate, a series of roughly quantitative experiments were made, using varying proportions of the two materials. A weighed amount of powdered $KClO_3$ was treated in a beaker with a weighed amount of the 40 per cent. formalin and the beaker immersed in hot water in order to start the reaction. The residue left in the beaker after the reaction had ceased was dissolved in water and titrated with standard solution of silver nitrate to determine the amount of chloride present. From the amount of KCl found, the weight of formalin representing the formaldehyde destroyed in the reduction of $KClO_3$ to KCl was then calculated from the reaction

$$2KClO_3 + 3HCHO = 2KCl + 3CO_2 + 3H_2O.$$

The results of these tests are shown in the following table. It is to be noted that if the reaction

$$KClO_3 + 3HCHO = KCl + 3HCOOH$$

is assumed, the calculated amounts of formaldehyde consumed will be just twice those given in the table.

Tests of Residue Remaining after Reaction between Formalin and Potassium Chlorate.

Test No.	$KClO_3$ Used, Grams.	Formalin Used, Grams.	Calc. $KClO_3$ Reduced, Grams.	HCHO Oxidized (Equiv to KCl Found), Grams.	Formalin (40%) Equiv. to HCHO Oxidized, Grams.
1	7	12	3.917	1.439	3.59
2	6	12	3.817	1.402	3.50
3	6	12	3.620	1.329	3.33
4	5	12	3.750	1.375	3.44
5	4	12	3.726	1.369	3.42
6	3	12	2.990	1.098	2.75
7	2	12	2.010	0.738	1.85

In Tests 5 and 6 a very small amount of liquid remained in the residue after the reaction; in Test 7 an appreciable amount of liquid remained and a determination of formaldehyde showed 1.104 Gm. HCHO, equal to 2.76 G. of 40 per cent. formalin. In Tests 1 to 5, inclusive, where the weight of $KClO_3$ was at least one third of the weight of the formalin, the amount of HCHO oxidized was fairly constant, the KCl found indicating that only part of the $KClO_3$ had been reduced. In Tests 6 and 7 the excess of formalin was such that practically complete reduction of the chlorate was effected and the amount of formalin oxidized much less.

A number of qualitative tests were made using formalin and sodium chlorate in proportions varying from 6:1 to 2:1, the maximum temperatures reached during the reaction being noted. With the ratios 2:1, 2.5:1, and 3:1, this temperature was 108–109° C., while with lower proportions of chlorate (4:1 and 6:1) the temperature was slightly less, 104° to 105° C. In each case the reaction started at 60–65° C., was violent at about 75° C., and lasted only about 30 seconds, the maximum temperature being indicated near the end of the reaction.

The writer hopes that comparisons of the actual disinfecting efficiencies of the permanganate and chlorate methods will be made by those who may be interested in the practical side of the question and that the chlorate method may be found to be of some use.

CHLOROCOSANE.[1]

Chlorocosane is a solvent for dichloramine-T, which is proposed for the purpose by Drs. H. D. Dakin and E. K. Dunham. The method of preparation is as follows: Paraffin wax, preferably melting at 50° C. or higher, is placed in round-bottomed flasks and heated to about 120°. Two flasks connected in series, each containing a half kilo of the wax, may be conveniently used. A rapid current of chlorine from a cylinder of the liquefied gas is then passed through the molten wax in the flasks, each of which is provided with a thermometer and the necessary glass tubes. The temperature should be controlled within the limits of 125°–140°. The first flask in which the reaction is most vigorous will require but little heating. Chlorination is continued until the contents of the flasks have increased in weight 45 to 55 per cent. of the weight of wax taken. It will be found convenient to complete the chlorination of the first flask and then remove it, and transfer the second to its place, putting a fresh flask of paraffin wax after it. In order to avoid undue discoloration of the product, a minimum amount of rubber tubing should be used for the connections. Wide glass tubing should be used for passing the gases, and the ends of the delivery tubes are preferably blown into bulbs provided with a number of fine orifices to promote good contact between the gas and oil. Hydrochloric acid is, of course, evolved freely during the reaction. After the requisite amount of chlorine has been absorbed, the oil, while still warm, is shaken vigorously with 5 per cent. of its weight of dry sodium carbonate, and then filtered through a dry fluted paper. The clear oil, which has a light yellow or sherry color and is slightly heavier than water, is then ready for use. It possesses a viscosity intermediate between that of olive oil and castor oil, has almost no odor, and is perfectly bland when sprayed up the nose or placed on skin or wounds. Chlorocosane at room temperature can dissolve from 8 to 10 per cent. of dichloramine-T. For wound-treatment a 7.5 to 8 per cent. solution is strong enough for all purposes, and is most conveniently prepared as follows: A portion of the oil—for example, a quarter—is heated to 75° or 80° C. and the weighed amount of solid dichloramine-T is then added. The latter substance will promptly melt and dissolve in the warm oil, which is then at once diluted with the remainder of the oil and the whole well mixed. If necessary, the solution can be filtered, but with pure materials this is not required. The clear solution should be at once stored in small amber, corked bottles, and not exposed to unnecessary heat.

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[1] British Medical Journal, reprinted from *The Chemist and Druggist.*

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

Determination of Creatinin in the Blood.—Tchertkoff describes a technic with which it is possible to detect grave insufficiency of the kidney by the creatinin content of the blood. With only 15 Cc. of blood serum it is possible to ascertain the creatinin content and also the indican and urea content, and thus obtain deep insight into the kidney functioning. He says that the normal creatinin content does not surpass 18 Mg. to the liter of serum. Above 25 Mg., retention is certain. First there is retention of urea, then of creatinin, and later of indican. As the kidney functioning improves they disappear in reverse order. The serum is freed from albumins with an equal quantity of a 20 per cent. solution of trichloracetic acid. After agitation it is filtered, and to 2.5 Cc. of the filtrate is added an equal amount of a saturated solution of picric acid and 1 Cc. of a 20 per cent. solution of sodium hydroxid. By the end of fifteen minutes the fluid changes in tint to a yellow or orange, proportional to the creatinin content. If the tint in ten minutes is still light yellow, the creatinin content is probably within normal range. Above 35 Mg. to the liter, the tint shows orange or even red. With a colorimeter the exact figure can be determined. (*The Journal of the American Medical Association.*)

Volumetric Estimation of Mercuric Oxycyanide.—Mercuric oxycyanide, used as a disinfectant, particularly for the hands, may be analyzed as follows: A weighed quantity of 0.3 to 0.4 Grm.

of the salt is dissolved in 50 Cc. of cold water, and the liquid, after treatment with 1 Grm. of sodium chloride and a drop of 0.2 per cent. methyl-orange solution, is titrated with N/10 hydrochloric acid until it turns red. After the volume of acid required is read, 2 Grms. of potassium iodide are added to the solution, and the yellow liquid thus obtained is again titrated with N/10 hydrochloric acid as before. From the two volumes of acid required the percentages of oxycyanide and cyanide in the salt may be calculated, the reactions proceeding according to the equations: (1) $HgO, Hg(CN)_2 + 2HCl = HgCl_2 + Hg(CN)_2 + H_2O$, and (2) $Hg(CN)_2 + 4KI + 2HCl = HgK_2I_4 + 2KCl + 2HCN$.—A. Tagliavini. Boll, *Chim. Farm.*, 1917, 56, 297–299; through *J. Chem. Soc.*, 1917, 112, II, 510.) From *Food and Drug Analysis* through *The Analyst.*

ESTIMATION OF MERCURY IN GALENICAL PREPARATIONS.—The method of destroying organic matter previously employed in analyzing protein preparations containing silver is applied to the determination of mercury in galenical preparations. The substance (0.3 to 0.5 Grm.) is heated with concentrated sulphuric acid (10 Cc.) and nitric acid (sp. gr. 1.4, 3 Cc.) until reddish-yellow vapors are not further evolved, the liquid becomes clear and colorless, and the flask is filled with sulphuric acid fumes. If the vapors still smell of sulphur dioxide, treatment with nitric acid (3 Cc.) is repeated. After being cooled, water (25 Cc.) is added, which is removed by evaporation. The cold solution is treated with water (15 Cc.) and potassium permanganate solution until a permanent pink coloration is produced; the latter is discharged with ferrous sulphate, the solution diluted with water (75 Cc.) and titrated with N/10 ammonium thiocyanate solution in the presence of ferric alum. The method is suitable for organic and inorganic preparations of the oxides of mercury, but not for such as contain the haloids. It can also be used for estimating mercury in plasters and pills, and in ointments, provided that they are tolerably free from paraffin.—H. Wastenson. (*Pharm. Post.*, 1917, 50, 125–126; through *J. Chem. Soc.*, 1917, 112, II, 509.) From *Food and Drug Analysis,* through *The Analyst.*

VOLUMETRIC ESTIMATION OF ZINC PHENOLSULPHONATE.—In the presence of bromine and an acid, zinc phenolsulphonate reacts in accordance with the following equations: $(OH{\cdot}C_6H_4{\cdot}SO_3)_2Zn$,

$7H_2O + H_2SO_4 = ZnSO_4, 7H_2O + 2OH \cdot C_6H_4 \cdot SO_3H$ and $2OH \cdot C_6H_4SO_3H + 12Br = 2C_6H_2Br_3 \cdot OH + 6HBr$. Exactly 0.5 Grm. of the crystallized zinc phenolsulphonate is dissolved in water and the solution made up to 500 Cc. In a flask holding about 300 Cc. and fitted with a ground stopper, 50 Cc. of this solution are mixed with 50 Cc. of 0.6 per cent. potassium bromide solution and 50 Cc. of 0.1671 per cent. potassium bromate solution, 5 Cc. of concentrated sulphuric acid being then added, and the flask again shaken and left closed in a dark place at about 25° C. for three hours. Ten Cc. of 10 per cent. potassium iodide solution, recently prepared, are next added and, after the lapse of an hour, the iodine liberated is determined by titration with N/10 sodium thiosulphate. The number of Cc. of the thiosulphate used is subtracted from that required in a blank test with the 50 Cc. of bromide and 5 Cc. of bromate alone: the remainder, multiplied by 0.00447, gives the weight in Grms. of crystallized zinc phenolsulphonate in the 50 Cc. of solution taken.—G. Adanti. (*Boll. Chim. Farm.*, 1917, 56, 317–318; through *J. Chem. Soc.*, 1917, 112, II, 517; through *The Analyst.*)

Detection of Foreign Oils in Castor Oil used for Lubricating Aviation Engines.—For the detection of foreign oils in castor oil the only method sufficiently sensitive is the determination of the acetyl value, which will indicate the presence of 1 to 2 per cent. of arachis or other oils. The solidification-point and the solubility in alcohol will only indicate the presence of 5 per cent. of arachis oil, whilst Bellier's arachidic acid test will not detect less than 7.5 per cent. of arachis oil. A more sensitive test is to determine the turbidity temperature of a solution of 1 volume of the oil in 5 volumes of 95 per cent. alcohol. In the case of pure castor oil the solution can be cooled below —20° C. without becoming turbid, whereas in the presence of arachis oil the solution shows a turbidity at temperatures varying with the proportion of foreign oil. Thus, the solution of a mixture of castor oil with 5 per cent. of arachis oil becomes turbid at + 6° to + 5° C.; with 4 per cent. at + 3° C., yielding a copious precipitate at 0° C., with 3 per cent. at 0° C.; with 2 per cent. at — 2° to — 3° C.; and with 1 per cent. it becomes opalescent at — 4° to — 5° C., and turbid at —9° C. Another method of detecting and estimating arachis and other foreign oils in castor oil is to shake 20 Cc. of the sample with 80 Cc. of petroleum spirit (boiling between 35° and 70° C.) in a stoppered graduated cylinder, and to allow the liquids to separate. In the case of pure castor oil the increase in the volume of the oily layer, due to solution of the petroleum spirit, will be about 11 or 12 Cc., but in the presence of foreign oils will be greater, and the amount of increase affords a rapid criterion of the purity of the oil. After complete separation, 50 Cc. of the petroleum spirit layer are evaporated and the residue weighed. Twelve samples of pure castor oil yielded from 8.35 to 8.85 per cent. of residue, the average being 8.52 per cent. By deducting the average figure from the amount of residue obtained from a mixture it is possible to estimate the amount of foreign oil present. For example, castor oil containing 30 per cent. of arachis oil yielded 38.61 per cent. of residue; oil containing 4 per cent. yielded 12.73 per cent.; and oil containing 1 per cent. of arachis oil yielded 10.04 per cent. of residue. The residue from the petroleum spirit extract is suitable for the estimation of arachidic acid by Bellier's method.—C. Frabot. (*Ann. Chim. Anal.*, 1917, 22, 217–223.) From *The Analyst.*

USE OF TEXTILE FIBERS IN MICROSCOPIC QUALITATIVE ANALYSIS.—Fibers from flax, cotton, viscose silk (cellulose xanthate), lustron silk (cellulose acetate), gelatin silk, wool, mohair, and true silk, were tested with litmus in neutral acid, and alkaline solutions. Silk was found to be the most satisfactory in every respect, the particular kind of silk having little or no effect on the results. The sensitiveness of litmus silk depends on the degree of adsorption of the dye, and on the degree of purification of the raw silk and of the litmus. Silk fibers may also be used as carriers for lacmoid, but this is less sensitive than litmus. The sensitized fibers are examined microscopically for change of color when partially immersed in a drop of the fluid under examination on a slide. Litmus silk fibers can be used for the detection of either acid or alkali, while Congo red viscose silk fibers can only be used for the detection of acidity. In the case of mineral acids a solution as dilute as N/4500 will give a positive reaction with litmus silk; acetic acid fails beyond N/100; the fibers are not quite so sensitive to alkali. Congo red fibers cannot be used to differentiate organic acids from mineral acids. Elaborate directions based on Wartha's procedure (*Ber.*, 1876, 9, 217) are given for the preparation of extremely pure litmus reagent. The most sensitive silk threads for use with litmus were those that had been treated by a preliminary boiling for one hour in a 2 per cent.

"Ivory" soap solution.—E. M. Chamot and H. I. Cole. (*J. Ind. and Eng. Chem.*, 1917, 9, 969–971); through *The Analyst.*

Arsenic in Glucose.—The author made a comparative study of the accuracy of three methods of determining small quantities of arsenic (in solutions free from organic matters), viz., the Marsh-Berzelius, the Gutzeit, and a so-called diaphanometric method in which the arsenic is reduced to the elementary state by hypophosphorous acid in presence of sulphuric acid and estimated from the cloudiness of the liquid in comparison with a series of test solutions of known arsenic-content treated in the same way at the same time. The possible error of all three methods was found to be of the same order, about one tenth of the amount of arsenic determined, but the Gutzeit method is not considered so trustworthy as the others for quantitative purposes. The diaphanometric method is somewhat more expeditious than the Marsh-Berzelius method; it is rendered inexact by the presence of traces of nitrates or nitrites. From solutions containing sugars, traces of arsenic can, after oxidation with bromine, be completely precipitated by entrainment in precipitates of ammonium magnesium phosphate formed in the solutions. Modifying a procedure described by Vuaflart (*Ann. Falsif.*, 1916, 272), the author applied this method to commercial glucoses; the phosphate precipitate was dissolved in nitric acid, all traces of the latter were then eliminated by evaporation with sulphuric acid, and the sulphuric acid solution was used for the determination of arsenic by the diaphanometric method. Experiments described indicate that traces of arsenic in beer-wort are not eliminated to any extent during fermentation or fining of the fermented beer.—J. H. L.—A. Kling. *Ann. Falsif.*, 1917, 10, 438–450; through the *Journal of the Society of Chemical Industry.*

MEDICAL AND PHARMACEUTICAL NOTES.

Foreign Body in the Eye.—Curran (*Boston Medical & Surgical Journal,* September 27, 1917) states that at the Norton Company during the past year there were treated 1,300 cases of injury to the eye. Of these 90 per cent. were directly attributed to foreign bodies. By the rules of the factory the employees are forbidden to treat each other's eyes, and every man is required to report at the shop hospital for every accident, however trivial. The method of examining the eyes is as follows: First, inspect the lower conjunctival sac. This can be done by simply pulling down the lower lid and telling the patient to look up, thus exposing the whole conjunctival surface. Then take the upper lid. Here it is necessary to evert the lid in order to expose the whole conjunctival surface. The ease with which this can be done depends upon the experience and consequent dexterity of the surgeon. To do this easily, have the patient look down, grasp the lashes of the upper lid, place an applicator at the base of the tarsal cartilage and evert lid, thus exposing the entire fornix.

The cornea is then carefully searched with the naked eye; with a glass aided by a condensed light. If there be difficulty in the examination this will be remedied by instilling two drops of a 4 per cent. solution of cocaine. Pigment spots in the iris and pigment stains on the cornea may cause some doubt. If a foreign body becomes embedded on the cornea it always leaves a pigment stain, or so-called rust spot. This rust spot disappears in forty-eight hours after removal of the foreign body. A cotton-wound applicator usually removes foreign bodies lying loose in the conjunctival sac. Thereafter 20 drops of a 2 per cent. solution of argyrol are instilled and the patient discharged.

Embedded foreign bodies, whether they are situated on the cornea or sclera, always necessitate the use of an anesthetic, 4 per cent. of cocaine being the best. A corneal spud then enables the operator to remove the body. If the latter be large and deeply embedded it is best to use a Graeffe cataract knife. Thereafter hot compresses are used at home, the patient being given two drops of a 1 per cent. atropine to put the eye at rest. The number of accidents have been reduced to a minimum by the use of goggles, which should always be worn in work involving chopping or grinding or chipping, and where sparks or dust result from the operation. (From the *Therapeutic Gazette.*)

CHAPARRO IN DYSENTERY.—A decoction of *Chaparro amargosa* (*Castela Nicholsoni*) was recommended some years ago for amœbic dysentery (see *Prescriber*, 1914, pp. 225, 284; 1916, p. 118). Chaparro, or bitter bush, is a shrub which grows in Texas and Mexico. The entire plant is used, 6 to 8 ounces of the decoction being given by the mouth half an hour before each meal. Rectal enemata of from 500 to 2,000 Cc. are also given twice daily, these being retained as long as possible. A fluid extract is prepared, the dose of which is 60 to 180 minims. Its use has been reported in cases where emetine has failed.

In the third annual report of the Medical Research Committee reference is made to this drug by the biochemical department. Preparations of the plant have given promising results, and chemical examination has resulted in the isolation of two crystalline principles, both of which are being clinically tested. (From *The Prescriber.*)

Iodinized Liquid Paraffin.—Liquid paraffin, as is well known, passes through the intestinal tract unchanged and is not absorbed into the general circulation. This fact suggested to Julius H. Hoelscher (*Therap. Gaz.*, 1917, 33, 689; Oct.) the possibility of using liquid paraffin as a vehicle for drugs whose action it is desired to confine to the intestine, such as internal antiseptics, astringets, vermifuges, etc. His first experiment was with iodine, which was dissolved in the oil in the proportion of one grain to two ounces. The mixture is of a violet color, the iodine apparently being fixed by the oil. Several cases of "intestinal putrefaction" (the term being used for lack of more descriptive words for such cases) were treated, half-ounce doses being given once or twice daily, with satisfactory results. Hoelscher finds that (1) the iodine is not absorbed into the general circulation and cannot be detected in the urine; (2) iodine can be detected in the fæces; (3) there is no indication of iodism or toxic effects; (4) the laxative effect of the oil is not interfered with. He thinks there are great possibilities for a combination of mineral oil and remedies for intestinal parasites (chenopodium, turpentine, thymol, etc.), but this calls for further investigation.

A similar solution of iodine in liquid paraffin is used by R. T. Dobson (*British Med. Jour.*, 1917, 2,717; Dec. 1) as an application in trench foot. (From *The Prescriber.*)

Use of Soy Bean as Food.—T. B. Osborne and L. B. Mendel's study shows that the soy bean is relatively poor in calcium and chlorine. The addition of a small amount of calcium carbonate to a food in which the soy bean was the sole source of mineral constituents tended to stimulate growth to some extent, though not so efficiently as the addition of the more complex salt mixture. On diets containing either the soy-bean meal or the commercial soy-cake meal, together with fats and "protein-free milk" or the authors' "artificial" salt mixture, several broods of vigorous young have been produced, and these young have grown normally on diets the same as those on which their parents were raised. This is a further demonstration of the nutritive efficiency of this legume, in striking contrast with the adverse results obtained with kidney beans and garden peas. The soy bean is the only seed hitherto investigated, with the possible exception of flax and millet, which contains both the water-soluble and the fat-soluble unidentified dietary essentials or vitamins. This fact, taken with the high physiologic value of the protein, lends a unique significance to the use of the soy bean as food. (*Journal of Biological Chemistry,* Baltimore.)

An Effective Treatment for Canine Distemper.—Canine distemper is one of the most prevalent and, with the exception of rabies, the most fatal of all diseases of the dog. It is a disease of the growing dog, but adult animals are not immune to it. In treating it strict attention should be paid to diet, no meat should be given, carbohydrates, dog biscuit, boiled rice, stale bread, vegetables, milk, and meat soup fat strained, may be fed. Tonic drugs such as strychnine (1/500 Gr.), quinine, iron, arsenic, glycerophospates, nuclein, may be used in connection with the hypodermic treatment described below. Acetanilid, aconite, drastic cathartics, and diuretics must be avoided. After numerous experiments on all available medicines, vaccines and antitoxins for the treatment of this condition only two remedies have been found that proved of exceptional value. These are *Echinacea* and *Inula*. The compound of these two was originated five years ago by a New York physician for the treatment of human tuberculosis. It is shown that the two work synergistically to increase the natural resistivity of the blood towards invading organisms much as nuclein does only much more pronouncedly. The phagocytic power of the leukocytes is increased and therefore the opsonic index is raised. The proportion between the red and white corpuscles is normalized by the compound. It acts favorably in leucopenia and hyperleukocytosis; it exerts a certain destructive influence upon the coccus group of microorganisms and effectively eliminates the toxins from the body. For distemper it is to be administered intramuscularly in the thigh every twenty-four hours in doses from 2 to 10 mils according to the size of the dog. If given subcutaneously an abscess is likely to develop. Five or six injections are necessary alternating on either side of the body. Eighty cases have been treated this way; twelve have died, a mortality of fifteen per cent. No selection of the cases was made, they were taken just as they came into the hospital and many of them were suffering with complications, pneumonia, bronchitis, etc. Dr. S. K. Johnson, of New York, is using the compound in his hospital with like good results. Equine pneumonia, also yield to it. Little says it is the best and most powerful medium by which the opsonic index may be raised, is absolutely non-toxic, and promises to be widely used in many febrile diseases of the respiratory tract, particularly in equine influenza. (George W. Little, D.V.M., Chief Surgeon of the American Society for the Prevention of Cruelty to Animals, New York City. *Am. Jour. Vet. Med.*, 12, 691 (Oct., 1917).)

J. F. C.

PROTECTIVE INOCULATION AGAINST MUMPS.—The blood of convalescents from mumps was used as a prophylactic. Six to eight mils were injected intramuscularly in 17 children who were exposed to the disease. None of the inoculated children developed mumps, while one third to one half of those not inoculated did so. The blood was taken from children who had just recovered or had been well for ten days. (A. F. Hess, *Proc. Soc. Exper. Biol, Med.*, 12, 144, *C. A.*, 11, 3325.)

J. F. C.

SOLUTION OF SOAP IN TREATMENT OF WOUNDS.—R. G. Dixon and H. T. Bates have used this dressing in 368 cases. During the same period they treated similar cases with other antiseptics, including eusol, hydrogen peroxid and bismuth iodoform petrolatum paste, with the result that they are using more soap and less of the other antiseptics. A sample of common yellow soap was analyzed and found to contain, per cent.: water, 24.6; fatty acids, 63; combined alkali, 4.6; free alkali, nil; impurities, 7.8. This was considered suitable, and it was found possible to make a 2.5 per cent. solution of it. Small open muscle wounds in which there was no gas gangrene, after being opened up, and metal and cloth removed, were dressed with sterile gauze soaked in this solution. The dressings were left undisturbed for two, three or four days, provided there was no rise in temperature. At the first dressing the most striking features were less pain, the unusually clean appearance of the wound, absence of pus, and the redness of the whole of the tissues, the muscle in particular. In the same treatment of larger and deeper wounds a 2.5 per cent. solution of the bismuth paste in soft green soap was found to be quite satisfactory. Cases of penetrating wounds of the knee joint were treated by this method, the joints being irrigated and the capsule and external wounds closed. The patients did very well. In cases of gas gangrene the results were usually good. The points claimed for the soap solution dressings are that they clean up a wound quickly, the dressings are much less painful than ordinary dressings, there is a saving of labor, as the dressings need only be changed every three or four days, and the solution is easily procured, easily made and inexpensive. (*Lancet,* London, reprinted from *The Journal of the American Medical Association.*)

CORRESPONDENCE.

American Journal of Pharmacy,
145 North 10th St.,
Philadelphia, Pa.

Gentlemen: The enclosed is submitted for publication.

At a recent meeting of the board of directors of the Philadelphia Drug Exchange, attention was called, by Mr. H. K. Mulford, to the fact that the British Pharmaceutical Society had worked out (*Lancet,* Nov. 17, 1917, 766) changes in the formulas of the British Pharmacopœia in order to reduce the consumption of sugar and glycerin, that these modified formulas had been officially endorsed and adopted by the Pharmacopœia Committee of the General Medical Council of Great Britain for the duration of the war, and that this body had temporarily withdrawn from the British Pharmacopœia directions for the use of sugar and glycerin in certain preparations.

It is, of course, an open question, whether or not such a revolutionary step as modifying the U. S. P. and N. F. formulas to conserve the national supply of sugar, glycerin and alcohol is necessary *at this time,* as our natural resources are so large, but it is undoubtedly true that, by reason of the enormous demands made upon us, from abroad, sugar, glycerin and alcohol are becoming increasingly difficult to obtain, commercially, and the time may readily come when it will be impossible to secure such materials commercially and make the official preparations containing them.

The Philadelphia Drug Exchange, therefore, asks the Committee of Revision to consider the expediency or desirability, as a measure of preparedness, so to speak, of framing modified or alternative formulas of U. S. P. IX preparations containing sugar, glycerin and alcohol, and of issuing these in "supplements to the U. S. P. IX" for the duration of the war. The replacements directed should be based not only on conserving the supply, but also in protecting the cost of manufacture. As far as possible the basic ingredients of the formulas should not be replaced by articles of greater cost than those desired to be replaced.

As we understand it, the Committee of Revision of the U. S. P. IX has had the authority given it by the Convention of 1910 to issue "Supplements" to the present revision of the Pharmacopœia (see U. S. P. IX, XXXII), and could issue supplements giving permission to use modified or alternative formulas of official preparations for war emergency use.

The present war is the most destructive in the history of the world, and it behooves us to use every means of preparedness that shall conserve the food and drug supplies of the nation.

Yours very truly,

(Signed) J. W. England,

Secretary, Philadelphia Drug Exchange.

March 11, 1918.

The following announcement has been sent to the Conference Schools relative to the Fairchild Scholarship.

To the Schools of the American Conference of Pharmaceutical Faculties:

Dear Sirs: The Fairchild Scholarship this year will be awarded to a graduate pharmacist of one of the Conference schools and the examinations will be held June 25. Kindly make the announcement to your classes so that those who desire can compete for the Scholarship. The examination questions will be sent on order of the dean of your school under seal.

The Fairchild Scholarship Committee will thank you for giving as wide publicity as possible to this announcement.

Respectfully,

E. G. EBERLE,

Chairman, The Fairchild Scholarship Committee.

NEWS ITEMS AND PERSONAL NOTES.

F. W. Nitardy, Associated with E. R. Squibb & Sons.—Mr. F. W. Nitardy, Ph.C., who was recently elected to the office of the first vice-president of the American Pharmaceutical Association, has accepted a position with the well-known pharmaceutical manufacturing firm of E R. Squibb & Sons Co. of Brooklyn and is in charge of a branch of their pharmaceutical productions. Mr. Nitardy was formerly a resident of Denver, Col., and in the employ of the Scholz Drug Co. of that city. He is one of the active members of the A. Ph. A. and is giving efficient service in behalf of pharmacy.

A Pharmacy Honor Medal.—Mr. Hugo H. Schaefer, secretary of the New York Branch of the A. Ph. A., proposes a plan for the establishment of a Pharmacy Medal, corresponding in a measure to the "Perkins Medal" and the "Nichols Medal" that are annually awarded respectively by the American Chemical Society and the Society of Chemical Engineering as a distinctive honor for distinguished services rendered by any individual in the respective branches of the science which these national societies represent.

The plan proposed is that the New York Branch shall create a permanent fund to be invested in Liberty Bonds or other gilt-edged securities and the interest therefrom is to be used to defray the expense of the award. The gold medal or bronze medallion, suitably named, is to be awarded annually to the man or woman the results of whose efforts during the preceding year, or whose efforts during a number of years have culminated during the preceding year, would be considered as being the most important and advantageous for American Pharmacy.

The selection of the recipient for the honor is to be made by a standing committee consisting of the past presidents of the American Pharmaceutical Association and in case the number of these living past presidents is less than five, then the senior past vice-presidents of that Association are to be drawn upon in sufficient number to create a committee of five. No bar is to be placed upon the kind of work accomplished nor is the award to be restricted to any class of pharmacists, i. e., to teachers or so-called professional pharmacists alone.

The medal is to be presented by the senior past president of the New York Branch at a meeting of that Local Branch; the intention being to devote annually one meeting for this special purpose.

Rev. William Remington an Army Chaplain.—Rev. William Remington, a son of the late Prof. Jos. P. Remington, who was recently consecrated as suffragan bishop of the Episcopal Church for South Dakota, is now serving in France as chaplain of the Mayo Base Hospital Unit.

Price Cutting as an Unfair Method of Trade.—The Federal Trade Commission has cited the United Drug Company to answer a complaint of unfair methods of competition, and has appointed a time for a hearing thereon. It is averred that this company has violated the provisions of the Act of September 25, 1914, by selling at its local stores patent and proprietary articles of merchandise at less than cost and that such action and practices were engaged in for the purpose of suppressing competition in interstate commerce.

Lieutenant Milson Addresses the Students of the P. C. P.—Lieutenant Milson of the Canadian Army addressed the senior classes of the Philadelphia College of Pharmacy on Thursday morning, March 14. He very interestingly described the exploits of contingents of the Canadian Army who have rendered such signal service in the present war.

Adam Hastings Fitzkee, P.D., in the Aviation Corps.—Lieutenant A. H. Fitzkee, formerly Assistant to the Director of the Pharmaceutical Laboratory of the P. C. P., was a visitor to the College the other day. He has very promptly demonstrated an ability that in the short time since his enlistment has elevated him from the rank of private to a lieutenancy. We expect shortly to hear of his service for the allies on the other side of the ocean and undoubtedly he will give a good account of himself "over there."

Frank L. McCartney appointed Captain in the Sanitary Corps.—Mr. Frank L. McCartney, president of the New York Branch of the

American Pharmaceutical Association, and who for the past decade has filled a number of important positions associated with the trade interests, has been appointed Captain, Sanitary Corps, Medical Department of the Army. Captain McCartney has been assigned to service at the Medical Supply Depot at New York City.

Dr. Frederick B. Power Honored.—Dr. F. B. Power, who began his career as a research worker while a teacher in the Chemical Laboratory of the Philadelphia College of Pharmacy, his alma mater, and who later achieved an enviable reputation as an investigator mainly in connection with research carried on in the laboratories of Mess Burroughs & Wellcome in England, is serving as a member of the Chemical Committee of the National Research Council which is playing an important role in the present war. He is engaged in the U. S. Department of Agriculture as an expert in pyto-chemistry. Recently he has been further honored by election to the presidency of the Washington Chemical Society and also as Vice-President of the Washington Academy of Sciences.

OBITUARY.

Dr. Alfred Birch Huested.—Alfred B. Huested, M.D., Ph.G., until recently professor of botany and materia medica at the Albany College of Pharmacy, died at his home in Delmar, N. Y., on February 23, after an illness dating back to November of last year.

Dr. Huested was born at Clifton Park, N. Y., May 15, 1840. At the age of 12 years he removed to Albany, in which city he continued to reside until 1910, and it was here that his active work in pharmacy was accomplished.

His early education was in the public schools of Albany. At the age of 16, he engaged in the drug business with the firm of Dexter & Nelliger with whom he continued until 1859, when he began the study of medicine.

In 1862 he volunteered and entered the service as hospital steward. Obtaining a short furlough of 20 days during the winter of 1863–1864, he returned to Albany, passed the medical college examinations and that of the State Board. He was commissioned as first lieutenant and assistant surgeon in the 21st New York Cavalry and remained in this service until the summer of 1866. In this year he determined to relinquish the practice of medicine and to devote his energy to pharmacy and so he established the drug firm of A. B. Huested & Co., in which business he retained an interest until a few years ago.

In 1883, he was elected to fill the chair of materia medica in the Albany College of Pharmacy and retained this position from that time until last November. For the last five years he has, likewise, served as secretary of the Albany College.

In 1884, he was appointed by Governor Cleveland a member of the first Board of Pharmacy of the State of New York. At the organization of the board, he was made president and filled this position for sixteen years and at the time of his decease he was still a member thereof.

Dr. Huested was president of the New York State Pharmaceutical Association from 1880 to 1884. He joined the American Pharmaceutical Association in 1879 and in company with Mrs. Huested was a very faithful attendant at the annual meetings.

THOMAS TYRER.—Mr. Thomas Tyrer, F.C.S., F.I.C., treasurer of the Society of Chemical Industry and engaged in business as the managing director of Thomas Tyrer & Co., Ltd., Stirling Chemical Works of Stratford, died suddenly at his home, Hampstead, London, N. W., on February 21, aged seventy-six. He was born at Wolverhampton and his early education was in his father's school. In 1861, he came to London and entered as a student in the Royal College of Chemistry where in Chemistry he studied under Prof. Hofmann and in biology under Prof. Huxley and physics under Prof. Tyndall.

For more than fifty years he was associated with the manufacture of chemicals and pharmaceuticals. Although not educated as a pharmacist much of his personal work was in the drug and chemical industries closely allied with the drug business. In 1907, the British Pharmaceutical Conference, breaking established precedents, elected Mr. Tyrer as its president; a compliment as deserved as it was appreciated.

He was very closely associated with the work of the Society of Chemical Industry. He served a term as the President of this Society and for many years acted as the Secretary of the London Section of the Society. As a member of the Chemical Trade Section of the London Chamber of Commerce, he took a very active part in the numerous questions of great interest to the development of these industries and the upbuilding of export trade therein.

THE AMERICAN
JOURNAL OF PHARMACY

MAY, 1918

EDITORIAL.

A JOURNAL THAT IS READ.

Quite naturally an editor endeavors to gauge the effect of his work, to determine whether the selection of matter published, the literary menu that he serves, is acceptable and inviting to his readers. He realizes fully that the extent to which the publication, whose course for the time being he is shaping, is read determines not only whether he has the right viewpoint and ability but, likewise, whether the publication is fulfilling its proper sphere of usefulness as an educational medium, stimulating progress and recording the advancements in the interests which it serves and is a measure, also, of the service which it renders to its advertising clientele. Consequently, an editor, who conscientiously is concerned, is on the alert for evidences as to extent to which the subscribers are reading the journal and each wind-blown straw is indicative to him and becomes a foot rule of the success of his efforts.

An editor mentally debates if an original contribution is on a subject that will prove of interest to his readers. Somewhat uncertain of his decision to accept and publish, he awaits results. When he later finds that the paper has excited comment or republication in other journals, his debated query is answered. Again, an article in another journal impresses him as worthy of reprinting, but he is confronted by the thought that it is too technical to interest very many readers. However, he decides to reprint it and shortly his heart is gladdened by a letter from an esteemed educator commenting upon the pleasure he had experienced in reading this same article and, above all, a new subscription is directly traced thereto. Such examples are satisfactory affirmations of the correctness of his judgment.

The editorials, that gave publicity to his personal ideas upon current events, are possibly the most frequent subjects for his mental debates. To get the right "punch" in these to make them effective yet not repellant is at times difficult, especially if he is working under a high tenson and there is cause for vigorous expression.

Consequently, the editor welcomes not only timely contributions, but, likewise, suggestions and comments, even adverse criticisms of the articles he publishes as evidences of the value of his publication. Even though such comments refer only to errors of writers or of the compositor, they have a dual significance to him; first, because they give an opportunity for correction of the error and secondly because they show that the journal is read.

Coming down to the first person singular, the present editor of the AMERICAN JOURNAL OF PHARMACY has had some personal experiences that well illustrate the foregoing general remarks. The librarian of one of the departments of the government was one of a number of readers who called my attention to an error on the cover page of the February and March numbers of the JOURNAL, where the current volume was printed as "Vol. 91" instead of Vol. 90.

The communication of Dr. V. K. Chestnut published in the "Correspondence" in this number of the JOURNAL gives us an opportunity to correct an oversight, an inadvertent lapse of memory for the time being of a valued contributor. In commenting upon the award of the Hanbury medal to Prof. Greenish, the contributor referred to the late Prof. John M. Maisch as the only American who had been so honored, thus overlooking the fact, to which Dr. Chestnut directs attention, namely, that Dr. F. B. Power, a graduate of the Philadelphia College of Pharmacy, whose achievements in pharmaceutical and chemical research we have greatly admired, was among the few who had been so signally honored and that Dr. Power was an American of whom we are justly proud.

The fact that Dr. Fred. B. Power was for so many years a resident of England and that while residing there he engaged in some of his most noted investigations and that these were generally published as contributions from the Research Laboratories of Burroughs Wellcome & Co. has possibly led many who were not acquainted with his history to imagine that he was of English birth. Our contributor doubtless had so firmly impressed in his mind the association of Dr. Power with the literature of pharmacy and chemistry emanating from Great Britain that temporarily he was forgetful of the fact that our eminent alumnus was at all times a citizen of the United States, loyally adhering to American principles and traditions.

CAN PRICE-CUTTING BE CONTROLLED BY THE PRESENT LAWS?

The advocates of price maintenance are taking to themselves great encouragement and consider that their cause has been greatly advanced by the recent action of the Federal Trade Commission in filing complaint against Sears, Roebuck & Company, the Chicago mail-order house. They have gone so far as to claim that this complaint "is in complete harmony with the principle and purpose of the Stephens' Bill," the passage of which by Congress they are advocating, and to state "that the object of the latter bill is to protect the public against dishonest advertising and false pretenses in merchandising." Radical claims of this character may do their cause far more harm than good. The passage of the Stephens' Bill in its original wording will yield far less protection against dishonest advertising and false pretenses in merchandising than can be obtained by existing laws.

The truth is that the Stephens' Bill aims to extend *price monopoly* to articles already enjoying *monopoly of production* by virtue of being protected by patent or trade-mark and does not extend the principle of *real price maintenance* to all merchandising. Our patent laws aim to stimulate and encourage invention by granting for a period of years a *monopoly of manufacture,* but it never was the intent that our patent laws or trade-mark enactments should likewise establish the principle of price monopoly for products so protected. It should be so well known to the drug trade that comment should be unnecessary, that certain foreign holders of United States patents on medicinal chemicals, by unauthorized methods, stretched the patent protection to cover the right to forbid resale of their products which they had marketed in other countries into the United States, for the purpose of compelling the American consumer to pay prices many times in advance of what they supplied their products in other countries. It is somewhat peculiar that some of those who years ago so strenuously objected to the surreptitious methods of these German manufacturers, should not realize the danger of engrafting such a fallacy onto our patent law. The very fact that it is now aimed to create for patented articles *price monopoly* proves that such has not been a privilege heretofore enjoyed by patentees and that the foreign manufacturers should never have been permitted to thus mulct the American public.

A study of the language of the complaint filed by the Federal Trade Commission in the case cited, shows that the action has been taken under the Congressional enactments of September 26, 1914, and October 15, 1914, and that the complaint is *based upon the methods adopted* by the respondents in advertising, not a patent or trade-marked commodity, but an article of general distribution, a prime necessity—sugar. We do not understand that the use of sugar as a "leader" even was objected to but the advertisements of the sugar were such as to be considered by the Commission as *false and misleading* and that the purpose and intent and effect of the respondent company was to harrass and embarrass competitors and to suppress and stifle competition. Further, that in certain advertisements it had been represented that the quality of similar wares sold by competitors was inferior and that the competitors did not deal justly with their customers and that the respondent buys its goods in markets not accessible to its competitors and it complained "that such advertisements and statements are false and misleading and calculated and designed to deceive the trade and general public." It is further alleged that their method of offering sugar was discriminating in price between different purchasers of sugar, and that the effect of discrimination was to lessen competition and tended to create a monopoly.

It will be thus seen that the action is *against unfair and misleading statements and because these tended to create a price monopoly* and that in this respect the present laws have the very opposite purpose to the aims of the Stephens' Bill. It is our opinion that the present laws against improper advertising and false or misleading statements contained in such with the intent of deceiving, can effectively control such unfair trade methods and that by their enforcement these evils of commerce can be eliminated.

It must not be understood that we are at all adverse to price maintenance, but we submit that this should be accomplished by laws, if such are necessary, that will cover all forms of merchandise and not by special legislation to give price monopolies to products already guaranteed the monopoly of manufacture by patent right or trade-mark. If the advocates of fair trade by price maintenance will appreciate the necessity for a bill that carries the *real principle* to all lines of merchandising they will greatly enhance the prospect for early and favorable congressional action.

G. M. B.

A BRIEF SUBMITTED IN FAVOR OF ESTABLISHING A PHARMACEUTICAL CORPS IN THE UNITED STATES ARMY AS PROPOSED BY THE EDMONDS' BILL, H. R. 5531.[1]

Hon. S. Hubert Dent, Jr., Chairman and Members of the Committee on Military Affairs, House of Representatives of the United States:

Gentlemen: On behalf of the various national, state and local pharmaceutical organizations represented here as the proponents of the measure under consideration and, likewise, in the interest of the many thousands of men in the army of our country who are now experiencing the trials and dangers of soldiering, this formal argument is presented.

The earnest consideration of Congress is requested to the wholly inadequate and dangerous methods of dispensing medicines practiced in our national military service. In contrast with the highly organized and efficient pharmaceutical service assured alike to his French compatriot and to his German enemy is that stintingly granted to the American soldier. This is humiliating to the pharmacists of this country and is not at all creditable to the Medical Department of the Army and is incompatible with the standing of the United States among the nations.

Shortcomings of the Army Hospital Service.

The shortcomings of the hospital service of the army has been the subject of repeated reports and in the past there have been before Congress several measures whose purpose was to bring the personnel of the Hospital Corps to a grade of efficiency commensurate with the grade of service which its members are expected to perform.

In the last annual report of the predecessor to Surgeon-General Gorgas, he referred to "the injustice which was done to the Hospital

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[1] Filed with the Committee on Military Affairs, at the hearing held Tuesday, March 19, 1918.

Corps which has made it difficult to obtain a good class of men and retain the services of non-commissioned officers. When the Hospital Corps was organized in 1887, it was recognized that its members would be required to do work that was not attractive to enlisted men and which would require special qualifications. . . . Opportunities for extra duty pay are provided in other branches of the service, but are denied to Hospital Corps soldier." To this he might have added that in the other lines of service, the intelligent, capable man can be promoted and attain commissioned rank and keep in the line of advancement, but in the hospital Corps he can never become more than a sergeant and after years of faithful service and reënlistments he may be credited finally with the non-commissioned grade of master hospital sergeant.

At that time, Brigadier-General Tasker H. Bliss, commanding the Southern Department, in his annual report said: "The condition of the Hospital Corps at the present time is a matter of very serious concern. The number of men present for duty is altogether too small to permit the efficient performance of the work that regulations, orders and customs of the service seem to require to be done. The service is so arduous for the really good men, and so unattractive, and the pay is so small that the application for transfer to the Corps of a superior man is now an extremely rare occurrence. There are very few applications for authority to reënlist, while there is a constant depletion due to desertions and discharges."

A writer, editorially commenting upon these Departmental reports, wrote: "Owing to these and other inequalities of pay and opportunity, the Hospital Corps is now recruited mainly from men who realize their inability to make good in other branches of the service where the pay and opportunities for advancement are so much better. It is a matter of official record that the morale and quality of the Hospital Corps are progressively declining quantities."

In the report of the then Surgeon-General, he urged that "the Secretary of War recommend to Congress the reorganization of the Hospital Corps" and openly stated that this "was one particular in which the Medical Department is unprepared to fulfill its responsibility to the Army and the nation." The reorganization then recommended by keen and competent military authorities has not yet been accomplished, despite the present war necessity for more efficient service. The *Journal* of the American Medical Association, at the time and since, has advocated reorganization and efficient assistance to the physicians and editorially stated "there should be no opposition from any quarter to legislation that would remedy an obviously dangerous condition."

The Surgeon-General is held responsible for the health of the Army and the efficiency of its medical service In the recent hearing before the Senate Committee on Military Affairs, "Surgeon-General Gorgas described the difficulty of caring for the men in the camps with the untrained orderlies who are generally charged with looking out for the less serious cases of illness." In this statement he admits the inefficiency of the hospital service for which the responsibility is upon his Department and which the enactment of the bill now under consideration would in a large measure correct by providing an organized pharmaceutical corps which would give to the physicians the needed intelligent assistance and provide the grade of service in this Department which the soldiers are entitled to receive.

THE SOLDIER IS THE ULTIMATE CONCERN OF THE MEDICAL DEPARTMENT.

Those in the military service of the nation are entitled to the very best medical attention that the government can procure. A nation that is proclaimed as the wealthiest and as the most progressive of all nations must not assume any second place in providing the means for the preservation of the health and lives of those serving in its army. The people of the United States will expect the Medical Department to adopt the most efficient methods for the conservation of the health and lives of our soldiers and for the recuperation of the unfortunate wounded. In this war, as never before, must human lives be salvaged and national resources conserved and our national assets, of education as well as of materials, be utilized to the best advantage if victory is to be ours. The nation will not be contented to accept such platitudes as "the needs of the soldiers can be provided for satisfactorily under the present organization." Especially not when the inefficiency of the service has been pointed out in reports emanating from the same Department.

Surgeon-General George J. H. Evatt of the British Army very aptly stated "that the Medical Department existed for the individual benefit of the soldier and if they failed in their duty to him they were not faithfully discharging their obligation. The ultimate soldier was the person whom they all served."

How Drugs Are Dispensed in the United States Army.

The dispensing of potent remedial agents, whether in civil practice or in the military service, should be restricted to those who have been especially educated and trained as compounders and dispensers of medicines. This principle is so thoroughly established that the states, and, likewise, the District of Columbia and our insular possessions, in the exercise of their police power, have by legal enactment provided for boards of pharmacy to examine and license those to whom authority only is given to compound and dispense medicines. Nevertheless, in the Medical Department of the Army, this principle, firmly established in the laws for the protection of the lives of the people, is ignored and the dispensing of medicines to our soldiers is permitted to be done frequently by the unqualified private who has had no pharmaceutical training. From one camp comes the information: "A motorman, a butterman and an apprentice machinist are over me (a graduate of a school of pharmacy) and according to army regulations are dispensing and compounding medicines to men in the army."

The Army medical supplies necessarily include such poisonous drugs or their preparations as aconite, atropine, belladonna, cocaine, colchicum, hyoscyamus, morphine, nux vomica, opium and strophanthus. "The dispensing of drugs or compounding of prescriptions is done by the non-commissioned officers of the Medical Department," we are officially informed and the information is at hand that in many cases these sergeants are without any special education or training and would not be admitted to the examinations of any board of pharmacy. Surely the soldier is entitled to pharmaceutical service and protection equal at least to that which his state provides for him in civil life.

Under such conditions, we are compelled to accept as facts such reported errors as "the dispensing of antiseptic tablets of bichloride of mercury instead of phenacetin and normal salt solution tablets," "morphine tablets for calomel," "digitalis tablets for Brown mixture tablets" and "liniment tablets given internally."

The statement has been officially made that "the pharmaceutical preparations of the Army, especially in time of war, are for the most part in tabloid form; the pharmacy is therefore a matter of dispensing rather than of compounding of preparations." This indicates that pharmacy as practiced in the U. S. Army is very elemental indeed and that even the very basic ideas of professional pharmacy are ignored. Such service must necessarily be far from satisfactory or efficient as protecting the interests it is supposed to serve.

On the battle line and in advanced positions, drug dispensing is necessarily limited and confined mainly to first aid. However, in the hospitals and in the convalescent homes and infirmaries, treatment is given to many sufferers from disease as well as the wounded and here will be found many cases requiring continuous and extended treatment and such cases will rapidly multiply as the war is prolonged. To seriously propose that such shall be treated with "canned medicine" in "tablet form" and denied the services of competent compounders of appropriate remedies is certainly not in accordance with our present knowledge of what is essential to conserve life whether in time of peace or "in time of war."

For some purposes, tablets are a convenient and useful dosage form, but for many purposes and for many medicines they are absolutely unfitted. Not infrequently, where prompt and reliable action is desired, the conscientious physician is compelled to select some other form of medication. The most serious evil resulting from this "ready made medicine" and tablet dosage is that too often the patient is made to fit the medicine on hand instead of a remedy being prescribed to fit the needs of the patient. There can be no question as to the superiority of the individual treatment over this method of "treatment *enbloc.*" The proper method and the ideal professional method would be for the physician or surgeon to diagnose each case, prescribe what that patient needs at the time and to have the medicines compounded freshly and dispensed by a competent pharmacist. To do otherwise is dangerous to the life of the patient and detrimental to the medical service.

PHARMACY AN IMPORTANT AND SCIENTIFICALLY DEVELOPED BRANCH OF MEDICINE.

The progress of the sciences has necessitated differentiation and specialization and this has separated modern medical practice into various branches, such as medicine, surgery, dentistry, veterinary medicine and pharmacy, and upon each branch devolves important duties for society. These are distinct yet equally important and interdependent upon each other. The medical practitioner and the surgeon are not trained to prepare medicines and as a rule are but very indifferently acquainted with drugs or their composition and the methods of preparation and the compounding of medicines. These are the special province of the pharmacist and upon the proper performance of his duties, the practitioners of the other branches of medicine are compelled to rely. Unless the drugs are properly selected and the medicines skilfully prepared and dispensed their skill and knowledge goes for nought. Upon the faithful and capable performance of the work of the pharmacist depends the success of the medical profession and, likewise, the lives of the patients.

The pharmacist of to-day is a professionally educated gentleman and his qualification to practice his profession is passed upon with as much care as is done in any of the other professions. The minimum preliminary education is fixed by many state statutes and his professional education is established by a National Syllabus of studies. In addition many are taking special postgraduate work in the higher scientific studies such as bacteriology and clinical chemistry. The established regular pharmacy course includes anatomy, physiology, materia medica, botany, pharmacognosy, chemistry, practical compounding, posology, toxicology as well as commercial training and to make sure that he has the experience, most of our states require four years practical pharmacy experience before licensure. It will be thus seen that the pharmacist is well equipped to perform his special functions in the interest of society. Moreover, a professional pharmacist is necessarily a continuous student as with each advance either in pharmacy, medicine or allied science he is compelled to further study.

American pharmacists hold a prominent position in the world development of their profession, and their standing is repeatedly recognized by foreign authorities and their investigations and research work have been very generally accepted as conclusive. The United States Pharmacopœia ranks as the peer of any national pharmacopœia. In the more recent revisions of this authority, the pharmacists have contributed very largely the chemistry, botany and pharmacognosy of the standards as well as most of the formulas contained therein. The other legal authority for medicines, the National Formulary, has been prepared entirely by a committee of the American Pharmaceutical Association. It is inconceivable that the War Department should ignore this important branch of the medical profession and to-day has not commissioned in its service a single eminent pharmacist. Pharmacists are not unpatriotic and are not unwilling to serve their country but they resent being advised that there are but "two avenues open for pharmacists in general at the present time: (1) To enter the Hospital Corps as a private. (2) As a non-commissioned officer in the Medical Enlisted Reserve Corps." The acceptance of such advice they realize means destruction of their professional and business success for a service in which after possibly years of duty and even with reënlistment they might attain the rank of master hospital sergeant and without future prospect either in civil or military life.

Equally are they ready to resent the imputation that this bill "is designed for the benefit of the persons desiring to enter service—through increased rank and pay." Pharmacists are fully justified in insisting that there shall be organized pharmaceutical corps in the government service, through which the members of this branch of the medical profession can render their most efficient service to the nation. In civil life both the practitioners of medicine and of pharmacy are essential for the conservation of life and health. Will not the conservation of the lives and health of our soldiers also require the exercise of both of these professions? Physicians are not called upon to enlist as privates and to work up from such to the higher position in the medical corps. Then why must pharmacists be so unjustly treated?

PHARMACEUTICAL SERVICE A NATIONAL ASSET.

Pharmacy is recognized in civil life as the right arm of medicine and there is no reason why this position is lost in military duty. It is a waste of the nation's resources to utilize medical men to perform duties for which pharmacists are especially trained and for which the medical man has no liking. Especially so, when there is urgent need for the skill of the medical man along the very lines of his special education.

It is gratifying to note that the leaders in the medical profession are outspoken in their support of pharmacy as a necessary branch of the military medical service and in favor of its proper recognition with commissioned rank.

The *Journal* of the American Medical Association, on June 16, 1917, editorially commented:

> So far as official recognition of it is concerned, the science and art of pharmacy might not exist for the Army. To-day, as never before, victory in war goes to the nation that most effectively preserves the health of its fighting men. The physician is now of such military importance that the medical profession will be called on to make no inconsiderable sacrifices. It will materially lighten the arduous duties and responsibilities of the physician to have in the Army trained pharmacists who will be able to give intelligent coöperation. But it is imposing too greatly on the patriotism of those whose special knowledge is obviously a large asset to the Army, to expect them to enlist as privates without any recognition of their national worth. Pharmacists should be given a rank commensurate with their importance, first because it is but a simple justice to the pharmacists themselves, secondly, because the usefulness of the medical corps will be greatly augmented and, lastly, and most important, because the efficiency of our Army demands it.

War is the supreme test of a nation's efficiency and in time of war it is of paramount importance that each man be put to the work in which he can render the most useful service to the nation. The magnitude of modern warfare demands the most perfect organization and the most effective service and nowhere is this of more importance than in the medical service of the Army and Navy.

Each line of activity requires specialized education and training, and to permit one branch of activity to encroach upon the special field or duty of another means national inefficiency, if not actually national suicide. To place a skilled Army surgeon in charge of a medical supply depot to look after the procuring and distribution of medical and hospital supplies and the accounting thereof is wasteful of his special talent that may be sorely needed elsewhere. The military surgeon has more than enough to do to attend to the strictly medical needs of the sick and wounded and to make the necessary examinations and reports, and the medical profession is asking for skilled and adequate assistance and for relief from the non-medical work imposed upon the medical corps.

So far there has been no attempt to mobilize the pharmaceutical asset of the nation and to organize this into a pharmaceutical corps that will give to our soldiery a proper medical dispensing service; a service worth having. The responsibility for this failure to use so valuable an asset should be fixed. The department must explain to the satisfaction of the citizens of the United States why their kinsmen and loved ones whom they are sacrificing to the cause of the nation are not receiving the same care, attention and the scientific, hygienic and pharmaceutical service that has been provided for the soldiers in the modern armies of both our allies and enemies.

PHARMACEUTICAL SERVICE IN THE FOREIGN ARMIES.

No one has, as yet, estimated the percentage of mortality in the Army resulting from improper and inefficient medical service. If such be attempted the figures will probably be appalling. The statistics that have been compiled, however, show that in the past wars, the number of men dying from disease was many times that killed by the enemy. "During the Civil War, the Union Army lost by deaths from disease 182,216 and 93,369 were killed." "In the Spanish-American War of 1898, only 454 Americans were killed and 5,277 died from disease."

In the Russo-Japanese War, the Japanese demonstrated the life-saving value of a scientific and systematically organized medical department, and the remarkable reduction of mortality from disease and wounds during that war attracted world-wide attention.

In the present World War, Germany reports that 87 per cent. of her wounded are returned to the service. This remarkable conservation of life is very properly attributed to her highly trained medical and pharmaceutical corps and accounts very largely for the ability of the Germans to keep up their vast armies.

The pharmaceutical service in the German Army was completely reorganized in 1902. Since that date, the pharmacists, in addition to performing purely pharmaceutic duties, have been given charge of the hygienic, chemical and research laboratories of the Army and each ranking officer in the Pharmaceutical Corps must have taken special chemical instruction and qualified as a food and drug chemist.

The cadre of the corps is always maintained and the reserves are available for service in time of war need. While in the early part of the year 1913, the total number of commissioned pharmacists in both the Army and Navy was reported as only 85, this was very rapidly increased when the war was entered upon and in December, 1914, there were 1,500 commissioned pharmacists in the Army alone.

The commander of the German Army Pharmaceutical Corps is the *Oberstabs-Apotheker* and he is attached to the Medical Section of the Prussian Minister of War and has rank equivalent to that of a general of brigade.

Each army corps has an associated sanitary corps under the control of an apothecary officer (*Stabs-Apotheker*) who has charge of the pharmaceutical service and supplies and is the director of the laboratories connected with that corps. In Berlin, at the main Sanitary Depot, many of the medical and surgical supplies are manufactured under the pharmacists of the corps. Each army corps has likewise a supply depot and a manufactory of supplies to provide for the medicines and dressings for that corps and the pharmacist officer is specifically charged with keeping up supplies of these and the list of necessary medicines includes many important medicaments. While at the main supply depot, in Berlin, tablets, ointments, ampoules, bandages, sutures, plasters, etc., are manufactured in quantities the corps factory has many things to make.

France has perhaps the oldest attempt at organized army pharmaceutical service and shortly before the present war this was completely reorganized, and it is now given credit and lauded for the efficient services performed along many avenues including chemical services of great value to the civil as well as to the military authorities. The commander of the French Army Pharmaceutical Corps is called an Inspector and ranks as a Brigadier-General. The complete organization includes the titles of principal pharmacists, pharmacists, pharmacist-majors, assistant pharmacist-majors and with rank as colonels, lieutenant-colonels, majors, captains and lieutenants. When the French peace army of 500,000 men was rapidly increased to 3,500,000 trained soldiers, the pharmaceutical corps was automatically increased from the pharmacists in reserve, many of whom had already seen service and experience in the sanitary corps.

In January, 1915, over 1,200 of the mobilized pharmacists who had the necessary experiences and training were commissioned as first-class assistant pharmacist-majors with the rank of lieutenants. During the present war, the duties of the French Army pharmacists have been greatly extended so that to-day they are the chemists and analysts of the Army, examining all water supplies daily, and all foods, and testing much of the industrial materials supplied, making the clinical and bacteriological examinations for the medical men and studying gas warfare and providing the scientific means for combating these ingenious barbarities of the enemy. In addition the Pharmaceutical Corps procures or manufactures all of the medical and surgical supplies and manufactures directly much of these materials.

In Spain, as early as 1813, the Military Pharmacy Corps was formed. Despite the several changes and reorganizations of the Sanitary Corps that have taken place in that country since that date, the organization has been continued and its work made more comprehensive and beneficial. Its personnel comprises inspectors, subinspectors, pharmacist-majors, pharmacists of the first class and pharmacists of the second class and with commissioned rank from colonel to lieutenant.

In Japan "the Army has a Sanitary Supply Department and the Director of this Department is equal in rank to a colonel, and wherever there is a barrack, it has a field hospital which has a Department of Pharmacy, and the director of this pharmacy is equal in rank to a lieutenant-colonel. The rank of the pharmacists in this army is from sub-lieutenant to a colonel." On a peace footing the Japanese Army Pharmaceutical corps numbered 110 commissioned officers divided as follows: 1 colonel, 3 lieutenant-colonels, 7 majors, 30 captains and 70 lieutenants. The salaries are stated to be from 500 yen for second lieutenant to 3,000 yen for the colonel.

In the United States we have at present *no pharmaceutical corps whatever.* We have no governmental manufacture of medical supplies for the army under the supervision of trained pharmacists. During the Civil War at a government laboratory established in Philadelphia, under the supervision of the late Prof. John M. Maisch, many of the medicines needed for the Union troops were manufactured with a saving of many thousands of dollars. We have no specially trained pharmacists to attend in any organized or authoritative manner to the compounding and dispensing. We have absolutely nothing that bears any semblance to a modern army pharmaceutical corps. Can the United States continue to ignore the value of the important services of the pharmaceutical corps in foreign armies and the potent lessons of efficient organization?

Unfortunately the United States, in this matter, has copied the methods of the British Army Medical Department, whose service has been denounced at home as "obsolete," "incompetent" and "inefficient." Great Britain and the United States are the only two prominent nations whose army medical service does not provide for an organized pharmaceutical corps.

In England this serious defect has been forcefully pointed out and the comparisons made with the well-organized and equipped medical and pharmaceutical corps of the continental armies have not been considered as at all creditable to their home government. The British government has recently commissioned pharmacists sent to France and information at hand indicates that England is likewise awakening to the necessity of availing herself of the special knowledge of trained phamacists. In the colonial Armies raised by Australia this step has already been taken and a pharmaceutical corps has been organized and controls the pharmaceutical service for its armies and likewise for the transport service. With the desire to learn fully the organization and work of the pharmaceutical corps in the various armies, the Australian government has deputized Major Cossar of its pharmacy staff to make a special tour of study among all the allied armies.

The bill introduced by Mr. Edmonds will provide the machinery needed for the establishment of this desirable innovation and improvement in the medical service of the American Army. By establishing a system, it will provide for a reserve corps and for the automatic extension of the service in time of war. It provides for the various duties, qualifications, grades, studies and advancement of those entering the service. The very moderate rank provided for in this act, ranging from major to lieutenant, should be extended so as to advance the status of the head officer of the corps to the rank of colonel.

As the United States Army is now being reorganized in conformity with the organization of the French Army, is it not, likewise, an opportune time to organize a pharmaceutical service copied after their excellent plan?

George M. Beringer,
President National Pharmaceutical Service Association,
Samuel L. Hilton,
Chairman, Committee on Status of Pharmacists in Government Service, American Pharmaceutical Association.

BRIEF SUBMITTED BY PHILADELPHIA DRUG EXCHANGE.[1]

Committee on Military Affairs,
House of Representatives,
Hon. S. Hubert Dent, *Chairman*,
Washington, D. C.

Gentlemen: In re subject of legislation to establish a commissioned pharmaceutical corps in the U. S. Army:

The text of this sermon—and it is a brief one—is "Safety First."

I hold in my hand the official "drug table" or "list of staple medical and surgical supplies" authorized by the Secretary of War for use in the Army hospitals. It gives the "*minimum* number of articles essential to the conduct of the nation's medical activities" and specifies the various quantities and kinds of containers that may be ordered by the Army drug stores from the general supplies. It embraces 406 drugs and drug products, 26 pills, 53 tablets and tablet tributes, 31 unofficial tablets, 27 hypodermic tablets, 10 ampoules 10 miscellaneous items and 14 biological products, or a total of 577 items. Of these 200, or over one third, are the most deadly poisons known to man.

For example, the Army drug stores contain diluted hydrocyanic acid. This deadly poison is exceedingly rapid in action. One and a half grains of the anhydrous acid is capable of producing death in the human subject (Christison). One or two drops of the acid will kill a vigorous dog in a few seconds (Wood). The famous chemist, Scheele, who discovered hydrocyanic acid, was killed by the vapors set free in the breaking of a flask of the liquid (Sollmann). The fatal dose of the official acid (2 per cent.) is 45 minims (Taylor). Each Army drug store may contain enough of the official acid (8 fluid ounces) to kill 80 soldiers.

Arsenic is in the Army drug stores, also. In overdoses it acts with very great energy and destroys life in a short time. It was at one time used very extensively for criminal poisoning, especially in the seventeenth century. An Italian woman, Toffania, carried this science to its greatest refinement. She killed dogs with arsenic and then used the saliva of such dogs (which contained arsenic) as a means of killing human beings. The fatal dose of arsenic is upwards of 1.5 grains (Sollman). Each Army drug store may contain enough arsenic (8 ounces, ap.) to kill 2,500 soldiers. There may be, also, enough sodium arsenate (16 ounces, ap.), a soluble compound of arsenic (the fatal dose of which is about 2.5 grains), in each such store, to kill 3,000 soldiers more.

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[1] Presented at hearing on the Edmund's Bill held March 19, 1918.

Corrosive sublimate is in the Army drug stores, also. It is a violent, corrosive poison. The fatal dose is 0.18 Gm. (Sollmann), or about 2¾ grains. There may be enough corrosive sublimate in each Army drug store (16 ounces, ap.) to kill 2,800 soldiers.

Carbolic acid is in the Army drug stores, also. It is a powerful, irritant poison, causing, in overdoses, great agony and suffering. Suicidal poisoning by it is extremely common. The minimum fatal dose is 150 to 225 grains (Sollmann). There may be enough carbolic acid in each Army drug store (80 ounces, ap.) to kill about 200 soldiers.

Strychnine sulphate is in the Army drug stores, also. This is a violent poison, causing, in overdoses, intense agony, convulsions and death. It is one of the most commonly used poisons, both for suicidal and criminal purposes. It is used, also, in the West, for the destruction of wolves. The smallest fatal dose to man is ½ grain (Sollmann). There may be enough strychnine sulphate in each Army drug store (¼ ounce, ap.) to kill 200 soldiers, in addition to the thousands of strychnine tablets allowed, as well as tincture of nux vomica (16 fl. oz.), which contains strychnine, to kill many more.

Opium (powdered) is in the Army drug stores, also. It is a very frequent means of suicidal poisoning and accidental doses are not at all rare. The fatal dose of opium is about 45 grains, but as little as 3 grains have been fatal (Sollmann). There may be enough opium in each Army drug store (8 ounces, ap.) to kill 150 soldiers, enough tincture of opium (16 fl. oz.) and tincture of deodorized opium (16 fl. oz.) to kill several score more, and enough morphine sulphate (5 ounces, ap.), the toxic dose of which is ½ to 6 grains, to kill 800 more.

The above-mentioned six poisons of each Army drug store have the potential possibilities of killing about 10,000 soldiers! The remaining poisons of the list represent still greater death-dealing possibilities.

These illustrations are typical and could be multiplied if necessary but they suffice to show the serious possibilities of the 200 poisons out of the nearly 600 drugs contained in each Army drug store and the imperative necessity of placing Army pharmaceutical practice in the hands of legally qualified pharmacists, and not in the hands of men that no State Board of Pharmacy could possibly recognize as being legally competent.

It is a remarkable fact that, in the Army Medical Department, there is no "regulation" that physicians *must* use trained pharmacists for the performance of pharmaceutical duties, and in consequence they may and do delegate the preparation, compounding, dispensing, and in some cases the administration of the drugs and poisons they order for their soldier-patients to barbers, blacksmiths, undertakers and the like, while trained pharmacists in the same hospital perform non-pharmaceutical duties.

The result of such a system, or lack of system, is that mistakes must occur, even if not recognized. Physicians are not pharmacists. They know nothing about technical pharmacy. They have not been trained to differentiate between poisons and non-poisons by physical and chemical tests, although they should be competent to do so clinically (and then it may be too late), and when their untrained assistants make a mistake and dispense a poison for a non-poison, the patient suffers and perhaps dies and the "mistake" possibly is buried with him. The toxic symptoms of certain poisons resemble the symptoms of certain diseases. Thus: The symptoms of arsenical poisoning may be mistaken for gastro-enteritis, diarrhoea, etc., those of corrosive sublimate poisoning for dysentery, those of strychnine sulphate poisoning for tetanus, spinal meningitis, etc., and those of opium poisoning for alcoholism, uræmia, etc.

The danger of such untrained service is not only one of commission, but also one of omission. Not knowing the proper methods of preparing, compounding and dispensing drugs and not having competent pharmaceutical help, Army physicians go in the direction of the least resistance (and safety) and "muddle through" by making the patient fit the remedy and not the remedy fit the patient. The consequence is that the soldier-patient fails to receive adequate and properly individualized treatment, and his recovery to health, if there be recovery, is more or less seriously delayed.

The Army physician is *not* to be blamed for this condition of affairs. He is the victim of an antiquated system of Army pharmaceutical practice such as is not tolerated abroad in the armies of

France, Germany, Italy, Japan and other countries. And he is doing the best he can under very untoward circumstances.

In official Army medical circles, the claim is made that pharmacy is a "non-essential specialty," so far as the Army is concerned, and that, therefore, pharmacists could serve the Army only in a limited, special capacity.

The answer to this is, of course, that scientific pharmacy, such as is required, for example, in the preparation, compounding and dispensing of the drugs contained in the "drug table" of the Army hospital, is just as essential in military life as it is in civil life.

The official "drug table" referred to is now the vade mecum of the Army physician. It is an excellent work, so far as it goes, embracing a large proportion of the drugs and drug products of the U. S. Pharmacopœia and National Formulary. But rarely can these articles be prescribed alone. They must be given, as a rule, with diluents, flavors, excipients, etc., and yet we learn through a high medical authority at Washington, D. C., that "Many (medical) men feel that there is no need of pharmaceutical workers in the Army, inasmuch as the use of the 'drug table' is the proper procedure when prescribing."

If it is the proper procedure to use such a "drug table," and no one questions this, it is equally proper that its articles, when prescribed, shall be compounded and dispensed with proper pharmaceutical skill.

The importance of pharmaceutical service in the Army is shown by the fact that provisions are now being made for 250,000 hospital-beds for sick and wounded American soldiers and yet it is alleged that pharmacy is not essential in the Army.

In addition, clinical laboratory analysis, such as chemical, microscopical, bacteriological and radiographical work by trained pharmacists, would be an invaluable diagnostic aid to physicians in Army hospital practice.

The possibilities of the poisoning of soldiers by men who have had no technical training in pharmacy is sufficient, alone, to justify the establishment of a scientific, properly systematized, pharmaceutical corps in the Army. *"Safety First" is the American soldiers' first right in medical treatment.*

If pharmacy is the non-essential specialty claimed by the Medical Department, why is it that the Medical Department recently had transferred to it (Nov., 1917), by the War Department, as enlisted personnel, all the drafted men in the Army who have had pharmaceutical training? Was it to secure professional services on the basis of a non-commissioned rank, or was it to side-track the movement to have established a commissioned pharmaceutical corps in the Army, or both?

We believe that the vast majority of physicians in the Army would prefer to have at their command, in practice, the same specialized highly trained pharmaceutical service they had in civil life before they entered the Army, and with professional rank, and that this is the attitude, also, of the great body of physicians of the whole country is shown by the following editorial from the *Journal of the American Medical Association:*

> "Physicians, dentists and veterinarians are officially recognized by the government as men of special training, whose technical knowledge can be of use to the nation in time of war. Provision is made so that men in these three professions can be enrolled as commissioned officers and their skill thus most efficiently used by the Army. The pharmacist, however—as a pharmacist—is utterly ignored. If he enlists he does so as a private. So far as official recognition of it is conceived, the science and art of pharmacy might not exist in the Army. To-day, as never before, victory in war goes to the nation that most effectively conserves the health of its fighting men. The physician is now of such military importance that the medical profession will be called on to make no inconsiderable sacrifices. It will materially lighten the arduous duties and responsibilities of the physician to have in the Army trained pharmacists who will be able to give intelligent coöperation. But it is imposing too great a strain on the patriotism of those whose special knowledge is obviously a large asset to the Army to expect them to enlist as privates without any recognition of their importance, first, because it is but simple justice to the pharmacists themselves, secondly because the usefulness of the medical corps will be greatly augmented and lastly, and most important, because the efficiency of the Army demands it."

The value of trained pharmaceutical service is universally recognized in civil life. Every one of the forty-eight states of the Union has a State Pharmacy Law operated under a State Board of Pharmacy, and in each of these states, the raison d'être for the enactment of such a law has been the protection of the public against the dangers of incompetency or worse in the preparation, compounding and dispensing of drugs, particularly poisons; it is required in every state that those who wish to practice pharmacy must show their knowledge of drugs and poisons and demonstrate their competency to prepare, compound and dispense the same.

Shall the men who are now serving this country in its hour of greatest need, who are offering their bodies, if necessary, as a sacrifice that the nation may live, be given *less* protection against the dangers—the serious dangers—of incompetent pharmaceutical service than they had in civil life before they enlisted in the Army? The answer rests with you, gentlemen!

PHILADELPHIA DRUG EXCHANGE,
(Signed) J. W. ENGLAND,
Secretary.

ARGUMENT OF DR. J. MADISON TAYLOR IN FAVOR OF A PHARMACEUTICAL CORPS IN THE U. S. ARMY.[1]

COMMITTEE ON MILITARY AFFAIRS,
HOUSE OF REPRESENTATIVES,
HON. S. HUBERT DENT, *Chairman,*
Washington, D. C.

Gentlemen: We physicians who appear before your committee would count ourselves blameworthy in advocating the establishment of a Pharmaceutical Corps in the military service, did we not believe on good authority we were rendering an important service to the nation and the nation's defenders.

In the forward press of advance in social and national welfare, the science of pharmacy, and in particular the present qualifications of pharmacists, may not yet be appreciated. They no longer are mere vendors or purveyors of drugs, they constitute a learned profession demanding of themselves a scientific training and equipment competent to meet the demands of modern medical, surgical and sanitary science. Among their ranks are numbered a large proportion of highly educated experts in many of the same fundamental lines on which the profession of medicine is advancing. They now constitute a powerful and effective national organization of research workers, of chemists, of biologists, of physiologists, of toxicologists, of serologists, of bacteriologists, devoted to the elucidation of the more obscure but essential problems concerned in conserving and saving human life.

They cover, and cover well, a domain which the medical profession cannot devote their time to, since pharmaceutic purposes are to perfect the instrumentalities and agencies surgeons must find ready to hand and in perfect condition to apply instantly in ever-widening clinical problems in any line of specialization. During stress of overwhelming work these skilled technicians, thoroughly trained in chemical and manipulative niceties, will prove invaluable.

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[1] Presented at hearing on the Edmonds Bill, H. R. 5531, March 19, 1918.

Of course, the number of these exceptionally educated men is still limited. They are increasing every year. Requirements in the schools of pharmacy are being rapidly raised. They aim to produce a group of men just as highly educated in their domain as are the medical students in theirs.

The preliminary educational requirements are also now much higher than was the case only a few years ago. In contrast with what these requirements were twenty or thirty years ago, modern pharmacy graduates are incomparably superior. In fact, primary requirements for the pharmacist today are equivalent to those for medicine in many states.

A point I wish to emphasize is that: "Many of the subjects pharmacists are required to study are the same as many of those the medical students pursue. They overlap, constituting a close association, an interdependency with scientific medicine."

They have become so necessary to the profession of medicine that they supplement in essential particulars all the advances of medicine, each having a definite domain, yet fully interrelated and interacting. "As the string unto the bow is," so is pharmacy to medical science at its best.

Let it be clearly understood that these pharmacists, while originally, and still to a large extent, merchants and manufacturers of drugs and remedies, number among them groups of research workers so highly trained as to be fully qualified to bear similar, indeed, equal, responsibility with physicians.

It is, of course, desirable that in making selection of pharmacists for military service, examinations shall be as exacting as shall meet the requirements of examining boards of the Army and Navy. Hence, the protection of the service, hence the welfare and lives of the enlisted men and officers, will be amply secured.

I am credibly informed that those pharmacists who now qualify and who seek military service must often surrender positions which remunerate them many times over what they would receive in service pay. Hence, their aim is a patriotic, not a selfish one. They expect rank for the purpose of securing attention and exercising authority within their domain.

Among the particular services a specially educated pharmacist could render are these:

He could supplement and contribute to the correlating data for the surgeon, in short in the "paper work."

He could perform a large part of the clinical laboratory work, urinalyses, blood examinations (morphologic or pathologic), in cytology, serology, vaccine preparation, bacteriology in the preparation of microscopic slides; in the examination of gastric contents, feces, exudates, transudates, and the like.

He could apply tests such as Wassermann, Noguchi, Widal, etc., all chemical procedures; he could keep all the material for these tests up to date.

He could supplement in X-ray work; keep the mechanisms of Rœntgenology in order, print plates, etc.

Many chemical problems arise in connection with poison cases. He could prepare all special materials for such procedures as hypodermoclysis, blood transfusion, Carrel-Dakin solution, etc. He could examine water, water supplies, all articles of food and drink, milk, meats and the like, which must be critically estimated.

Those who desire to become candidates for military service are already seeking instruction and experience in meeting minor surgical and medical emergencies, in the dressing of wounds, in the adjustment of dressings, solutions.

One surgeon and two pharmacists could probably do as much good work as two or even three surgeons.

The claim is made by the opponents of the Pharmaceutical Corps that the medicines or drugs used in the army are very simple and few, and served mostly in tablet form, readily handed out by any bright, alert enlisted man selected and trained for the purpose. How about the poisons? How many blunders are made by such an elementary form of dispensing? Full knowledge of the properties of death-dealing chemicals is an absolute essential for the man who handles them.

I have been credibly informed that the official Army Drug Table authorized by the Secretary of War comprises nearly 600 drugs and drug products of all kinds, *including poisons of the deadliest character*. Also that this drug table or list is admitted to be only the "minimum number of articles essential to the nation's medical activities."

Obviously the preparation, compounding and especially the dispensing of such dangerous products demands trained pharmacists. Note the gravity of this problem, the hideous peril run by our home defenders by such haphazard distribution.

How many fatal blunders have occurred? How can the surgeon keep control of the leaks in the chain of procedures from bottle to patient? How many curious inexplicable causes of death?

Should an error be suspected by the enlisted man who dispenses poisons there is every temptation to keep quiet and thus escape blame. Clearly our home-defenders deserve fully as much special skill in the distribution of drugs as do our home-makers.

LESSONS TO BE LEARNED FROM THE HEARING ON THE EDMONDS BILL.

By Robert P. Fischelis,

Secretary National Pharmaceutical Service Association.

The hearing before the Committee on Military Affairs on the Edmonds Bill brought out some very interesting points, indicating clearly the impression that has been made on the minds of the members of the committee by the arguments advanced against the formation of a pharmaceutical corps.

A study of the questions which were asked by the committee seems to indicate that very little attention has been given by Congress to the need of proper pharmaceutical service in the army, and that most of the members believe the medical department is taking good care of this phase of army work. Inasmuch as their ideas of medicine center entirely around the doctor of medicine, many members of the committee were surprised to know that just because a man is a good physician he may not be able to compound medicines. It was fortunate for the pharmaceutical representatives to be afforded an opportunity to explain what pharmacy really is and what kind of training its practice requires.

It was very apparent early in the hearing that some of the members of the committee felt that the Edmonds Bill was a selfish measure designed only to provide commissioned rank for pharmacists. The indications at the end of the hearing were that at least this thought had been somewhat dispelled in the minds of the committee.

Some of the Congressmen wanted to know why a pharmacist could not serve just as well as an enlisted man as he could as a commissioned man, and wherein the health of the boys in the army would be improved if commissions were granted to pharmacists. In answering this question, it was pointed out that in order to practice pharmacy properly the pharmacist must have authority; he must have sufficient standing in his community in civil life to converse intelligently with the physician and to take up with him matters regarding incompatibilities, etc. The army system prevents such close coöperation between pharmacists and physicians because of the distinction between commissioned and non-commissioned rank.

Another very important question that was raised concerned the number of commissions that would be required in order to supply enough pharmacists for our present army. The committee, in making its recommendation to Congress, is desirous of being specific in its statements, and wants to know how much increase in the expense of operation the formation of a pharmaceutical corps would require.

Every member of the committee was very much interested in the attitude of foreign governments toward their pharmacists, and many were surprised when they were told that the continental armies all have pharmaceutical corps which are doing very efficient work.

Some anxiety was expressed by one or two members as to the attitude of the manufacturing pharmacists toward the creation of a pharmaceutical corps. They believed that most of the medicines used were the "ready made" kind and simply required pouring the contents of one bottle into another. They overlooked entirely the present-day training of the pharmacist and his ability to render service in sanitation, bacteriology, etc. None of the pharmaceutical representatives who spoke before the committee touched sufficiently on this point. However, the committee granted the privilege to all of them of extending their remarks, and it is to be hoped that further information along this line has since been supplied.

What are the lessons to be learned from the attitude and the questions of the committee?

1. The pharmaceutical profession has been clearly shown that very few people know anything about the extent of training which the modern pharmacist receives. All judgment regarding pharmacy is based upon the average corner drug store, and even there surface conditions only are taken into consideration. The average layman sees nothing in a drug store except a service station for all sorts of

accommodation, and a place where drugs and many things unrelated thereto are sold. The scientific nature of the business is in the background and is therefore not impressed upon the layman. Congress consists essentially of laymen, who in turn represent the large group of people having the foregoing opinion regarding the druggist and pharmacy.

What, then, could be expected from the Committee on Military Affairs or Congress itself excepting an attitude such as was displayed?

The remedy is to educate the public and its representatives in Congress to the far-reaching possibilities of pharmacy and the work which the pharmacist can do. Since large bodies move slowly, it takes a long while to accomplish in a short time something that has been neglected for decades. However, the time is opportune and our propaganda work must continue, and continue with increased rather than diminished vigor.

2. It was plain to be seen that if a pharmaceutical corps were desired merely to give the pharmacist commissioned rank, little or no support could be expected for the measure. If the Edmonds Bill is passed it will be because Congress has been convinced that the men in the army are not now receiving the kind of pharmaceutical service they deserve. All of our propaganda work must, therefore, eliminate the selfish factor, forgetting that the pharmacist deserves a commission, and working on the basis that the men in the service deserve full utilization of the ability of the pharmacist in order to increase their chances of being returned from the army to civil life unharmed.

3. We must allay the fears of those connected with the medical department, as well as those who are providing army legislation, that pharmacists expect to antagonize the medical officers of the army or attempt sweeping reforms which would materially upset the service. We must emphasize the fact that a pharmaceutical corps will fit in with the present army scheme and increase the efficiency of the medical department without upsetting the organization. This is a difficult task, but if it is handled tactfully it can be accomplished. There is no desire on the part of the pharmacist to get in and destroy; his only desire is to be given an opportunity to coöperate.

Bearing these lessons in mind, the course for pharmaceutical associations and individuals to follow is very plain. There should be coördination and continued propaganda, and whatever pressure is exerted should be directed through the same channels and along the same lines. In that way we will make everyone's "bit" count. Very little can be looked forward to, however, if one group pulls one way and the other in the opposite direction. Fortunately, we have thus far had very little work at cross purposes and it is to be hoped, with the coming of the various pharmaceutical conventions, coöperation will be even greater and that at least once the pharmaceutical profession will be found united in advocating a measure which, if passed, will do more to place pharmacy on a professional basis than any other single thing that has ever been accomplished.

SOME POSSIBLE PHARMACEUTICAL USES OF PARA-DICHLORBENZENE. A PLEA FOR THE USE AND FURTHER INVESTIGATION OF A BY-PRODUCT RESULTING FROM THE WAR.

By W. A. Konantz, Research Chemist, College of Pharmacy, University of Iowa, Iowa City, Ia.

In the chlorination of benzene at ordinary temperatures about 85–90 per cent. of monochlorbenzene and 10–15 per cent. of dichlorbenzene, chiefly para, are produced. At the present time, enormous quantities of benzene are being chlorinated, for it has been found that picric acid can be made more cheaply from monochlorbenzene than from phenol. At the same time, however, large quantities of dichlorbenzene are accumulating, for which there is very little demand. For the complete success of this most valuable process of manufacturing picric acid, it is necessary that uses be found for the dichlorbenzene. Owing to the firmness with which the chlorine atoms are attached to the benzene nucleus, p-dichlorbenzene does not enter readily into chemical reaction, and all attempts to convert it into other commercially valuable compounds have so far been unsuccessful. The physical properties of this substance are such, however, that the writer believes it may prove of considerable value in pharmacy. Some possible pharmaceutical uses which have occurred to the writer are here described in the hope that pharmacists and manufacturers will try them out and so help to solve the problem of utilizing this by-product.

From the viewpoint of the pharmacist the most valuable property of p-dichlorbenzene, and the one upon which most of its pharmaceutical uses will undoubtedly be based, is its powerful destructive action on certain lower forms of life. Galewsky, who studied the relative efficiency of many substances as moth exterminators, reported[1] that p-dichlorbenzene is the most effective agent for this purpose, being superior to naphthalene, which is generally used. Many tons of p-dichlorbenzene could, undoubtedly, be disposed of annually in the form of moth-balls, moth-powders, moth-solutions, moth-paper, etc., if it were properly pushed. In physical properties p-dichlorbenzene resembles naphthalene very closely. It occurs as transparent, colorless flakes, somewhat unctuous to the touch, and of a faint, rather agreeable, camphor-like odor. It melts at 53° C. and boils at 172° C., the corresponding constants for naphthalene being 79° C. and 218° C.; it is, therefore, more volatile than the latter. Besides its greater efficiency as a moth exterminator, p-dichlorbenzene has the added advantage over naphthalene that the odor can be more readily removed from garments with which it has been packed. Strips of cloth saturated with a concentrated solution of p-dichlorbenzene in gasoline and dried, lost the odor completely after several hours of airing in the sun. The writer further finds that p-dichlorbenzene can be easily compressed into tablets with an ordinary tablet machine and that it can also be readily formed into balls by melting and pouring it into molds. On the whole, p-dichlorbenzene seems excellently adapted for use as a moth-repellant, and as it can probably be bought for less than naphthalene it deserves to supplant the latter for this purpose. The writer earnestly recommends that pharmacists and manufacturers introduce and push it as a moth exterminator.

The effect of p-dichlorbenzene on moths suggests that it may also be of value in exterminating or repelling other pests. Dissolved in benzine or any other suitable solvent and applied as a spray to the joints of woodwork, to clothing which has been attacked, and to other articles, it may prove effective against various insects, bedbugs, roaches, ants, flies, etc., and their eggs or larvæ. On account of the inflammability of benzine it may well be replaced by carbon tetrachloride as a solvent, as the dichlorbenzene is very soluble in this liquid, as it also is in alcohol, ether, chloroform and benzene. Solutions of p-dichlorbenzene may also prove useful against vermin on animals and birds, and as a spray for plants.

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[1] *Z. Textil. Ind.,* 1915, 506.

It is also possible that the insecticidal and antiseptic properties of p-dichlorbenzene may render it applicable in the treatment of certain skin diseases. The writer finds that it is very soluble in petrolatum, lard, and many fixed and volatile oils, and large quantities of it can be easily incorporated by simply stirring it into the melted base.

Many other uses for p-dichlorbenzene than those which have here been briefly mentioned may suggest themselves to those who will give the subject a little thought and carry out a few experiments. The attention of pharmacists and manufacturers has been called to this problem because it is nationally as well as commercially important that it be solved as soon as possible. It is hoped that those who work on the problem will publish their results, even though they may be negative, in order that the greatest possible good may come of their efforts. The writer will be glad to give such assistance as he can to any one who is interested.

URINARY ANTISEPSIS.[1]

A Study of the Antiseptic Properties and the Renal Excretion of Compounds Related to Phenolsulphonephthalein: Preliminary Report.*

By Edwin G. Davis, M.D., Resident Urologist, Johns Hopkins Hospital, Baltimore.

The ideal internal urinary antiseptic must be a drug which is chemically stable, nontoxic, and nonirritating to the lower urinary tract; which is antiseptic in high dilution (in urine, as well as in water), and which is eliminated unchanged in high percentage by the kidney. There is no such drug known. A consideration of the properties possessed by phenolsulphonephthalein, however, shows that this compound comes very close to filling all these requirements. Phenolsulphonephthalein is chemically stable, nontoxic and nonirritating, and is eliminated by the kidney with incredible rapidity and completeness; but it has no antiseptic properties, excepting in water in its free acid form. (Clinically it is used as the monosodium salt.) This remarkable compound, synthesized in 1898 by Sohon,[1] at Remsen's[2] suggestion, investigated later in Abel's[3] laboratory, and introduced into clinical use by Rowntree and Geraghty[4] twelve years later, has become the basis of the most widely used and the most satisfactory of all the tests of renal function. This is due to the remarkable rapidity and completeness with which phenolsulphonephthalein is eliminated by the kidney, and to its nontoxicity. Rowntree and Geraghty have given 1 gram doses to dogs without evidence of renal injury. Its marvelous rapidity and completeness of elimination is realized when one considers that a 6 Mg. dose, given intravenously, and therefore diluted about a million times by the blood stream, appears in the bladder in about two minutes; and, after one hour, from 60 to 70 per cent. has been excreted by the normal kidney. Furthermore, about 30 or 35 per cent. of this amount appears during the first fifteen minutes, and about 40 or 50 per cent. during the first half hour. In view of these remarkable properties, it was thought worth while to attempt a modification of the phenolsulphonephthalein molecule, with the hope that an antiseptic compound might be produced which still retained the properties of the original drug. As the problem gradually increased in scope, it was found advisable to investigate a large number of compounds distantly related to phenolsulphonephthalein, as well as those closely related. The total number of compounds experimented with at present is about 195, the antiseptic properties of which will be enumerated in subsequent publications. This is a preliminary report dealing only with compounds closely related to phenolsulphonephthalein.

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[1] Reprinted from The Journal of the American Medical Association, March 2, 1918.

* From the James Buchanan Brady Urological Institute, Johns Hopkins Hospital.

These compounds were not easily obtained. The original few were supplied by Mr. H. A. B. Dunning, of Hynson, Westcott and

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[1] Sohon, M. D., "An Investigation of Some Derivatives of Orthosulfobenzoic Anhydride," *Am. Chem. Jour.*, 1898, 20, 257.

[2] Remsen, I., "On a New Class of Compounds Analogous to the Phthaleins," *Am. Chem. Jour.*, 1884, 6, 180.

[3] Abel, J. J., and Rowntree, L. G., "On the Pharmacological Action of Some Phthaleins and their Derivatives, with Especial Reference to their Behavior as Purgatives," *Jour. Pharmacol. and Exper. Therap.*, 1909, 1, 231.

[4] Rowntree, L. G., and Geraghty, J. T., "An Experimental and Clinical Study of the Functional Activity of the Kidneys by Means of Phenolsulphonephthalein," *Jour. Pharmacol. and Exper. Therap.*, 1909, 1, 579.

Dunning, and by Clark and Lubs, of the Bureau of Animal Industry, Washington. Other compounds, made and donated through the courtesy of Dr. J. H. Sachs, of the graduate department of chemistry, Johns Hopkins University, and still others, obtained here and there from various sources, supplied sufficient material for the first few months of investigation, and gave very interesting results. During the past year, however, the work has been carried out, and is at present being continued, with the collaboration of Dr. E. C. White, chemist in the Brady Urological Institute. A more detailed report, including tables of antiseptic values and rates of excretion, and with discussion of the chemical phases, will shortly be published as a joint article.

Although the literature contains no record of any attempt to synthesize an internal urinary antiseptic, various workers (following the pioneer work of Ehrlich in chemotherapy) during recent years have attempted to correlate chemical structure and physiologic action, and thus produce compounds with a desired specific therapeutic action. It is not my purpose to discuss this literature. For an excellent summary of recent work done along the lines of chemotherapy, the reader is referred to publications of Lewis.[5] The problem which Lewis and his co-worker, Krauss,[6] are investigating is analogous to the problem on urinary antisepsis outlined above, in that they started with a dye (trypan red) which possesses the peculiar property of becoming localized in the caseous centers of tuberculous masses, and experimented with numerous modifications of this compound, with the hope that one might be produced that would inhibit the development of the tubercle bacillus, and still retain the localizing tendency of the original compound.

Limited space does not permit a discussion of the so-called urinary antiseptics in present use, and of the great need of a really efficient drug for this purpose, which may be given either intravenously or by mouth and which will cause an inhibition of bacterial development in the urine, regardless of the reaction of the latter. For a complete summary of this phase of the subject, and a discussion of the relative values of the various urinary antiseptics in common use, the reader is referred to the paper published by Hinman[7] in 1915. This paper will be freely quoted. Of the urinary antiseptics in common use, hexamethylenamin is by far the best, but has very definite limitations, owing mainly to the fact that an acid medium is essential for the liberation of formaldehyde. Furthermore, "the necessity of concentration, and time for the accumulation of formaldehyde in antiseptic amounts, largely destroys the value of the drug for kidney antisepsis; for bladder antisepsis in cases with polyuria or frequent urination, except when retention in some form is present; in cases of urinary fistula, notably postoperative prostatics during the period of incontinence, and in cases with continual bladder drainage as in true incontinence or with retention catheter; and for urethral antisepsis no matter what the infection. The greatest usefulness of hexamethylenamin is in bladder prophylaxis in cases in which the above urinary conditions are not present. . . . Methylene blue, in a dilution of 1:150,000, will inhibit the growth of staphylococci," and would therefore seem of value in this type of infection; but there has been no experimental work showing that methylene blue does not undergo modification either in the blood stream or in the urine so as to lose its antiseptic value, which will be shown below to be the case with many other compounds. Hinman states that "the value as internal urinary antiseptics of other substances such as salol, oil of sandalwood, salicylic, boric and benzoic acids, is very limited," and concludes that there is no known drug with properties even approaching those of an ideal urinary antiseptic.

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[5] Lewis, P. A., "Observations Bearing on the Possibility of Developing an Experimental Chemotherapy of Tuberculosis," *Bull. Johns Hopkins Hosp.*, 1917, 28, 120; "Chemotherapy in Tuberculosis," *Am. Jour. Med. Sc.*, 1917, 153, 625.

[6] Krauss, R. B., "The Preparation of Compounds of Trypan Red with Iodin and Other Substances," *Jour. Am. Chem. Soc.*, 1914, 36, 961.

As stated before, an ideal internal urinary antiseptic must be chemically stable, nontoxic, antiseptic in urine (as well as in water), and must, like phenolsulphonephthalein, possess the property of high-percentage elimination. Possibly a compound not entirely nontoxic, but relatively so, might be suitable for the purpose. Provided the renal elimination of a given compound is sufficiently rapid and complete, and that this compound causes bacterial inhibition in urine in sufficiently high dilution, it is conceivable that small doses might serve to produce urinary antisepsis, even though the compound is moderately toxic. In view of the general toxic effects on the animal organism that an antiseptic compound may be expected to have, and the possibility of injury to the renal epithelium and of irritating effects on the lower urinary tract, one realizes the hopelessness of the problem if the synthesis of a completely harmless urinary antiseptic is the goal. The matter then resolves itself into a question of relative toxicity; that is, the attainment of a compound combining minimum toxicity with maximum efficiency, so that small but effective doses may be safely used.

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[7] Hinman, Frank, "Urinary Antisepsis: A Clinical and Bacteriologic Study," *The Journal A. M. A.*, Nov. 20, 1915, p. 1769.

METHODS OF INJECTION.

Each compound was investigated with two objects in view: first, to determine the rate of elimination by the kidney, and second, to determine the antiseptic properties. Rabbits were used for injection purposes because (1) they are easily available and cared for in large numbers; (2) the ear vein is easily injected, and (3) the urethra of the male rabbit is large and easily catheterized. The drugs were injected intravenously in 10 Mg. amounts in 1 per cent. solution, and the rabbits catheterized after one hour. In the case of each drug a colorimetric estimation of percentage of excretion was made with the Hellige colorimeter, 10 Mg. of the drug diluted in 1,000 Cc. of water being uesd as a standard. In order to make certain that the total excretion for one hour was quantitatively recovered, the bladders of the rabbits were irrigated after catheterization, and the irrigation added to the urine obtained through the catheter. The percentage of excretion of each compound was estimated by averaging the results of at least two injections on different rabbits. It would have been impossible to determine the rate of excretion of such a large number of compounds had it not been that nearly all of them were highly colored and hence readily detected in the urine. Colorless compounds were rejected, excepting a few in which the antiseptic tests were unusually promising.

BACTERIOLOGIC TECHNIC.

Antisepsis in urine is quite a different thing from antisepsis in water. As will be shown further on and in subsequent papers, there are numerous compounds which are germicidal in high dilution in water, but which lose this property entirely when diluted in urine and which even permit the growth of organisms in urine when in relatively strong concentration. This astonishing fact has proved to be a great obstacle. It may be readily seen that the compound, the antiseptic power of which is due to its acid or basic properties, would become inert in urine on account of the buffer[8] value of the urinary salts. Other compounds, containing ionic silver, become inert in urine because the silver is precipitated by the chlorids. There remain, however, a large number of drugs whose loss of antiseptic strength in urine is due to some unknown interfering action, the nature of which is as yet undetermined. It must not be understood that this loss of antiseptic power in urine is noted after the compound has been passed through the animal body, but it occurs when urine is added to the aqueous solution of the compound in a test tube. For this reason it became necessary to carry on parallel germicidal tests both in urine and in water.

The colon bacillus was used throughout the experiments because it is the most frequent invader of the urinary tract, and because it is resistant to antiseptics, and is readily cultivated. Investigations with other organisms are to be carried on in the future. Each compound was studied with the view of determining (1) its germicidal properties (in water and in urine) and (2) its antiseptic or inhibitory properties in urine.

1. *Germicidal Test.*—In order to rule out a large number of undesirable compounds, it was necessary to establish an arbitrary standard of germicidal strength, and compare them all with phenol (carbolic acid). The arbitrary method chosen was the determination of the highest dilution of each compound which, in 1 Cc. amount, will kill one loop (3 Mm. internal diameter) of a twenty-four-hour broth culture of the colon bacillus, in one hour, at 37° C. Dilutions of the drug were made with sterile pipets in sterile test tubes, and all but 1 Cc. of each dilution was discarded. After the inoculation of each dilution with one loop of colon bacilli, and incubation for one hour, 0.1 Cc. of each dilution was transferred to melted agar, and plated. In transferring these 0.1 Cc. amounts, it was found convenient to use capillary pipets drawn out (from 3 Mm. glass tubing) long enough to reach the bottom of the test tubes. By connecting the large end of one of these capillary tubes

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[8] The term "buffer" action refers to the ability of mixtures of certain acid and alkaline salts in solution to maintain a practically constant hydrogen ion concentration, in spite of the addition of moderate amounts of acid or alkali. For detailed discussion, see publications of Henderson and Palmer, Clark and Lubs, and Shohl and Janney.

to a carefully calibrated small syringe (by means of a small rubber tip), it was found that 0.1 Cc. amounts could be drawn up with remarkable accuracy, irrespective of variations in the size of the capillary tubes. These tubes were used over and over again, large numbers being sterilized together by means of dry heat.

Parallel tests were run for each compound, sterile water being used for one series of dilutions and sterile urine for the other. It was found to be unnecessary to adopt any method of sterilizing the urine to be used for this purpose. Agar plates poured each day containing 0.1 Cc. of urine taken from a specimen voided in a sterile (second) flask by a normal individual were uniformly sterile. The factor of possible error due to modification of the urine through the process of sterilization was thus eliminated. For example, sterilization of urine by heat produces a marked change in the hydrogen ion concentration, the urine becoming much more alkaline.

The effect of the reaction of the urine in aiding or hindering the germicidal activity of a drug is an all-important factor. Henderson and Palmer[9] have shown that the hydrogen ion concentration of urine is normally subject to a considerable range of variation (p_H 4.8 to p_H 7.4), and that the average of this range is p_H 6.0 on the hydrogen ion scale, corresponding to 0.000001 N acid.[10] The importance of the reaction of urine when used as a culture medium has been pointed out by Shohl and Janney, who find that the colon bacillus fails to grow in urine at certain definite acid (p_H 4.8) and alkaline (p_H 9.2) end-points. In order to eliminate possible error, due to strongly acid or alkaline urine, the hydrogen ion concentration of each specimen of urine to be used for antiseptic experiments was determined, and the specimen rejected if the reaction was not approximately that of average normal urine, that is, p_H 6.0.

2. *Antiseptic Test.*—More important than the determination of the germicidal strength of these compounds was the determination of the highest dilution of each in urine that will cause an inhibition of bacterial development. For this, dilutions in urine were made in 10 Cc. amounts, sterile test tubes being used. Each tube was inocu-

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[9] Henderson, L. J., and Palmer, W. W., "On the Intensity of Urinary Acidity in Normal and Pathological Conditions," *Jour. Biol. Chem.*, 1913, 13, 393.

[10] For discussions concerning the hydrogen ion concentration of urine, and the technic for colorimetric estimation, see publications of Henderson and Palmer, Clark and Lubs, and Shohl and Janney.

lated (as in the germicidal test) with one standard loop of a twenty-four-hour broth culture of the colon bacillus, immediately after which 0.1 Cc. of each inoculated dilution was plated, as proof that the inoculation had been made, and for the purpose of comparison with a second plate which was poured (0.1 Cc. again being transferred) after the inoculated dilutions had been incubated for twenty-four hours at 37° C. The contrasting of these two plates, poured at twenty-four-hour intervals showed whether or not growth had taken place during the incubation period. The first plate (poured immediately after inoculation) usually showed about 10,000 colonies, roughly estimated. A second (twenty-four-hour) plate which was sterile or which contained very few colonies (less than 100) was considered proof of inhibition, while a plate showing countless numbers of colonies proved the absence of inhibition. In the vast majority of instances the contrast between Plates 1 and 2 was so marked that there could be no possible doubt. A daily control of inoculated drug-free urine invariably contained countless numbers of colonies in the second (twenty-four-hour) plate, showing that normal urine acts as a favorable culture medium for the colon bacillus.

PHENOLSULPHONEPHTHALEIN AND SALTS.

The properties of phenolsulphonephthalein itself, and of some of its metallic salts (sodium, silver, copper, mercury and barium), as illustrated in the structural formula given in Fig. 1, were first investigated. Phenolsulphonephthalein, in its free acid form, although almost insoluble, is nevertheless germicidal (against the colon bacillus, according to the arbitrary standard described above) in a dilution of 1 : 10,000; that is, it has about fifty times the strength of phenol. In urine, however, even in almost saturated solution, phenolsulphonephthalein permits the growth and development of the colon bacillus. A suggested explanation of this loss of power is that the water solution kills by virtue of its acidity whereas in

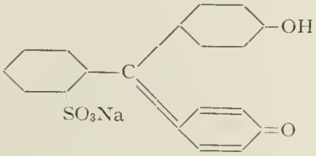

FIG. 1. Phenolsulphonephthalein (monosodium salt).

urine the acid properties are lost on account of the buffer value of the urinary salts. Furthermore, the monosodium salt, the form used clinically, has no germicidal action even in water, and in urine permits the growth of the colon bacillus even in a 1:200 dilution. The silver salt is extremely germicidal in water (having 5,000 times the strength of phenol), but in urine the silver is precipitated by the chlorids, and the germicidal strength, due to the silver ion, is lost. The germicidal properties of the silver salt of phenolsulphonephthalein, both in water and in urine, correspond very closely to those of silver nitrate. The fact that the chlorids are responsible is shown by a similar disappearance of germicidal action when the dilutions are made in physiologic sodium chlorid solution. Furthermore, when the silver salt is injected intravenously, the ionic silver is lost in the body, and the phenolsulphonephthalein appears in the urine free from silver, probably as the sodium salt. Mercurous and mercuric salts and the cupric salt, although having some germicidal value in urine, were discarded because of their toxicity. The barium salt was quite inert.

Conclusion.—The metallic salts of phenolsulphonephthalein give no promise of value as urinary antiseptics.

SULPHONEPHTHALEINS.

The compounds listed in the accompanying table are all analogous to phenolsulphonephthalein, differing from the latter compound only by the presence of various substituent groups in the phenol nucleus. All of these compounds excepting two are practically insoluble in water, as the free acid, but are readily soluble in the form of the sodium salt. Pyrocatechinsulphonephthalein and guaiacolsulphonephthalein, however, are soluble in water without the addition of alkali. Some of these compounds are quite germicidal in water (possibly owing to excess alkali necessary to bring them into solution); but, with the exception of one only, it is a uniform rule that they lose this action when diluted in urine. Pyrocatechinsulphonephthalein, the only one to retain its value, is germicidal in urine in a dilution of 1:500, and inhibitory in urine in a dilution of 1:1,000.

Very surprising results were obtained by the injection of these compounds. Although they are all quite closely related chemically, some of them are eliminated by the kidney with the same marvelous rapidity and completeness with which phenolsulphonephthalein is eliminated, while others appear in the urine only in traces or not at all. The excretion seems to be governed by no rule. With this class of compounds, no definite relationship between chemical structure and "renal affinity" could be established. The addition of methyl groups to the phenol nucleus (cresolsulphonephthalein) certainly does not interfere with excretion, while excretion is prevented by isopropyl, amino and carboxyl groups, as shown by thymolsulphonephthalein, aminosulphonephthalein and salicylsulphonephthalein.

The Excretion and the Antiseptic Properties of the Sulphonephthaleins.

Name.	Antiseptic Strength.				Excretion Percentage After One Hour.
	In Water.		In Urine.		
	Kills in One Hour.	Fails in One Hour.	Inhibits Development.	Permits Growth.	
Phenolsulphonephthalein	....	1:200	....	1:200	70
Thymolsulphonephthalein	1:200	1:1,000	....	1:200	Trace
Salicylsulphonephthalein	....	1:200	....	1:200	Trace
Hydrochinonsulphonephthalein	....	1:200	....	1:200	40
Cresolsulphonephthalein	....	1:200	....	1:200	70
Tetra-aminophenolsulphonephthalein	1:200	1:1,000	1:200	1:500	0
Alphanaphtholsulphonephthalein	1:200	1:1,000	....	1:200	Unstable
Orcinsulphonephthalein	....	1:200	....	1:200	70
Pyrocatechinsulphonephthalein	1:2,000	1:5,000	1:1,000	1:2,000	0
Tetranitrophenolsulphonephthalein	....	1:200	....	1:200	Hemoglobinuria
Guaiacolsulphonephthalein	1:200	1:1,000	....	1:200	Trace
Resorcinsulphonephthalein	....	1:200	....	1:200	75
Pyrogallolsulphonephthalein	....	1:200	....	1:200	30
Phenol	1:180	1:200	1:900	1:1,000	

The most interesting and disappointing feature shown by the sulphonephthaleins is the effect of the addition of OH groups to the phenol nucleus. Pyrogallolsulphonephthalein, hydrochinonsulphonephthalein and pyrocatechinsulphonephthalein are all hydroxy derivatives, differing only in the number and position of the OH groups, and, of these, the pyrogallol and hydrochinon compounds are excreted, whereas pyrocatechinsulphonephthalein, the only sulphonephthalein shown to be antiseptic in urine, unfortunately, is also the only one not excreted.

Conclusions.—1. Several other sulphonephthaleins are excreted by the kidney with great rapidity, just as is phenolsulphonephthalein.

2. None of the sulphonephthaleins investigated would be of value

as urinary antiseptics, since the only one showing antiseptic strength in urine fails to be excreted.

HALOGEN DERIVATIVES OF SULPHONEPHTHALEINS.

To illustrate the chemical structure of the halogen derivatives of sulphonephthaleins investigated, the structural formula (Fig. 2) is given. Those investigated were tetrabromphenolsulphonephthalein, tetrachlorphenolsulphonephthalein, di-iodophenolsulphonephthalein, dibromcresolsulphonephthalein and dibromthymolsulphonephthalein. These compounds, all used in the form of the sodium salt, show moderate germicidal ability in water, probably owing to excess alkali necessary to bring them into solution; but they all become inert in urine. Furthermore, none of them excepting tetrachlorphenolsulphonephthalein are excreted, and we therefore have in compounds of this class a definite relationship between chemical structure and "renal affinity."

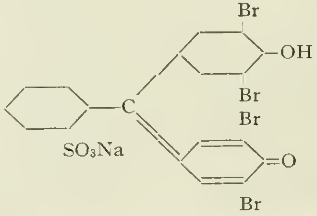

FIG. 2. Tetrabromphenolsulphonephthalein (monosodium salt).

Conclusions.—1. Substitution of bromine in compounds of the sulphonephthalein type prevents excretion by the kidney.

2. Halogenated sulphonephthaleins give no promise of value as urinary antiseptics.

PHTHALEINS.

These differ from sulphonephthaleins in that a carboxyl group replaces the sulphonic acid group, as shown in the formula (Fig. 3). Those investigated were phenolphthalein, thymolphthalein, tetrabromtetrachlorphenolphthalein tetraiodophenolphthalein, phenoltetrachlorphthalein and sulphonated phenolphthalein. None of these compounds were antiseptic in urine, nor were any of them excreted by the kidney, excepting the sulphonated phenolphthalein. It is interesting to note that the sulphonation of phenolphthalein gives a soluble compound (phenolphthalein sulphonic acid), the sodium salt of which is excreted almost as rapidly as is phenolsulphonephthalein. The similarity of names, however, between this compound and phenolsulphonephthalein should not give the impression that the two are the same. They differ in composition, structure and method of preparation. Since the sulphonation of phenolphthalein causes its rapid excretion, the conclusion might be drawn that the sulphonic acid group is essential for rapid elimination; but this theory is upset by the action of the following group of compounds. The sodium salt of sulphonated phenolphthalein has no antiseptic value.

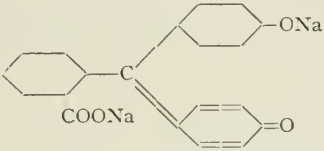

FIG. 3. Phenolphthalein (sodium salt).

Conclusion.—The phthaleins give no promise of value as urinary antiseptics.

XANTHONES.

Compounds of this class are characterized by the fact that the two phenol groups are linked together by an oxygen atom, as illustrated by the structural formula given in Fig. 4. It will be seen that this formula differs from that of phenolphthalein only in the presence of an oxygen atom, although the two compounds possess divergent biologic properties. The compounds of this class investigated were fluorescein (resorcinphthalein), sulphonefluorescein (resorcinsulphonephthalein), orcinsulphonephthalein, rhodamin and resorcinsaccharein. All of these compounds in solution are greenish and extremely fluorescent, and without exception they are excreted by the kidney with a rapidity as great as that of phenolsulphonephthalein, if not greater; the average rate of excretion for the group being 70 per cent. in one hour. Since these compounds are quite different chemically, but have one characteristic in common (the oxygen linking two phenol groups), and since they all show great "renal affinity," it is reasonable to assume that we have here a definite relationship between chemical structure and physiologic action.

This class further shows that the sulphonic acid group is not essential for rapid excretion.

As germicidal agents, all four are inert excepting rhodamin, which comes very close to filling all the requirements. Rhodamin, which differs from fluorescein in that the two hydroxyl groups are replaced by amino groups, is chemically stable and nontoxic, is rapidly excreted, and kills the colon bacillus in one hour in a dilution of 1 : 2,000, in water; but when the compound is diluted in urine, this property is entirely lost. An investigation of the nature of this interfering action in urine has not been completed, but present experiments indicate that the loss of antiseptic power of rhodamin in urine cannot be accounted for merely by the buffer value of the urinary salts, which would tend to neutralize any acid or basic properties that a drug might possess.

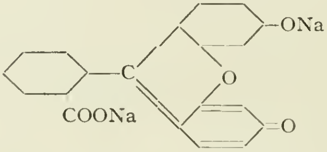

Fig. 4. Fluorescein (sodium salt).

Comment.

It is hoped that these experiments may call attention to the inadequacy of the urinary antiseptics in general use, and stimulate interest in the possibilities offered by synthetic chemistry. These investigations are at present being continued, and the properties of various related compounds studied, some of which are old and well known, and others of which are new compounds, synthesized so as to contain various chemical groups that have been shown to produce desired biologic properties.[11]

[11] In addition to the references already given, the following will be found of interest:

Clark, W. M., and Lubs, H. A., "The Colorimetric Determination of Hydrogen Ion Concentration and Its Applications in Bacteriology," *Jour. Bacteriol.*, 1917, 2, 1.

White, E. C., and Acree, S. F., "On the Quinone-Phenolate Theory of Indicators: The Electrical Conductivity of Solutions of Phenolsulphonephthalein and of Its Bromo and Nitro Derivatives," *Jour. Am. Chem. Soc.*, 1917, 39, 648.

White, E. C., "On the Quinone-Phenolate Theory of Indicators: The Reactions of Phenolsulphonephthalein and of Some of Its Derivatives," Thesis, Univ. Wisconsin, 1915.

CONCLUSIONS.

The property possessed by phenolsulphonephthalein, by virtue of which it is rapidly eliminated by the kidney, is by no means limited to this compound. Several other more or less closely related compounds show the same striking "renal affinity," and might also be of value in testing renal function were it not that phenolsulphonephthalein itself is so nearly ideal for this purpose.

Compounds of the xanthone class, that is, phthaleins (though not necessarily sulphonephthaleins) in which there is an oxygen atom linking the two phenol groups, show a similar remarkable "renal affinity."

The bromination of these compounds, both sulphonephthaleins and xanthones, interferes with their excretion.

In view of the hitherto overlooked fact that numerous actively germicidal compounds lose their strength (owing to an as yet unexplained cause) when simply diluted with urine in a test tube, the value of every drug used for the purpose of urinary antisepsis ought to be questioned until its antiseptic strength *in urine* has been experimentally demonstrated.

Since it has been possible to establish a certain relationship between chemical structure and renal excretion, and to predict, with a reasonable amount of accuracy, which drugs will and which will not be rapidly excreted; since the synthesis of germicidal compounds, very closely related to the types excreted, has been accomplished; and since one of these germicidal compounds (rhodamin) was excreted and would have been successful but for the interfering action of the urine, the problem has been shown to be worthy of further investigation.

NOTE ON EUONYMUS ATROPURPUREUS.[1]

By E. M. Holmes, F.L.S.

The root bark of *Euonymus atropurpureus,* although discarded for the U. S. P., is still retained in the B. P. Having recently had occasion to compare a specimen of the bark, which had been rejected as not genuine, with the description in the B. P., I found the description given in that work quite inadequate for recognition of the genuine bark by the eye or even with the aid of a lens. As in the case of Cusparia and other barks with a soft, friable, or spongy cork, the external surface is apt to vary greatly in appearance. On referring to Maisch's "Materia Medica" I found the following description, which is certainly better than that of the B. P.: "Description: Quilled or curved pieces about 2 Mm. (1/12 in.) thick; outer surface ash gray with blackish ridges or patches, detached in thin and small scales; inner surface whitish, or slightly tawny; fracture smooth, whitish, the *inner layers tangentially striate;* nearly inodorous; taste sweetish, somewhat bitter and acrid." Stille and Maisch, in the United States Dispensatory, state that the bark is "mottled with larger or smaller patches" or *fine longitudinal* scaly *ridges* and meshes with brown or blackish cork, detaching in very thin and small scales." The bark that arrives in this country is usually almost free of the blackish detachable minute scales, probably due to friction in the packing and the sea voyage, especially as the bark attracts moisture in a damp atmosphere.

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[1] Reprinted from the *Pharmaceutical Journal and Pharmacist,* February 23, 1918.

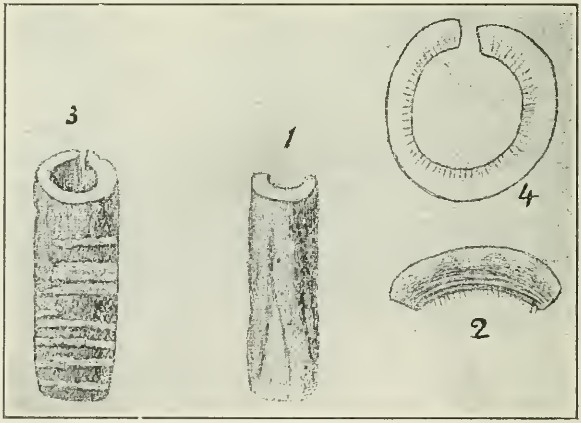

FIG. 1. *Euonymus atropurpureus,* showing longitudinally striated outer surface. FIG. 2. Showing tangential stratification of the liber. FIG. 3 False bark, showing tranverse scars on outer surfaces. FIG. 4. Showing absence of stratification in the liber.

The fine longitudinal ridges are also mentioned by Planchon and Collin's "Drogues-Simples," tome II, p. 594, but no mention is made of the blackish detachable scales, which are not usually present in European samples. A good idea of these longitudinal striations is given in "Pharmacopedia," the illustration having been drawn, under my superintendence, from genuine specimens in the museum of the Pharmaceutical Society by Mr. J. N. Fitch, pl. XVII, Fig. 2a.

Greenish, in "Materia Medica," p. 217, points out a characteristic feature of the bark (visible only under a powerful magnifier, such as a platyscopic or triplet lens), viz., that if the bark is broken transversely and the pieces separated very gently from one another, delicate mucilaginous threads will be seen connecting them, and consisting of the "mucilaginous" contents of certain cells of the bark. (In my opinion these contents are probably more of the nature of caoutchouc.) The character is, however, a useful one. This statement has been copied almost word for word by the author of "Pharmacopedia," p. 166, published two years later.

The specimen of bark sent to me as regarded with suspicion, and rejected as not genuine, consisted of about one part in eight of bark longitudinally striated externally, the transverse fracture showing tangentially striated liber, and at its inner edge the silky threads described by Greenish, and was, therefore, undoubtedly *Euonymus atropurpureus.* The other seven parts consisted of a bark almost identical in color and general appearance, but on the average somewhat thicker and *distinctly marked with numerous transverse scars;* the transverse fracture did not show any tangential striation of the liber, nor were the delicate threads visible in the fractured bark. The microscopical structure showed a distinct difference in the two barks. In euonymus the medullary rays are numerous, very narrow, and consist of a single row of cells, as shown by Planchon and Collin, *i. e.,* Fig. 4 (distinguishable by the cells being *radially* elongated, whilst those of the surrounding cells are slightly elongated *tangentially*).

In the false bark the medullary rays consist of about three rows of cells, and all more distant than in euonymus, and there are numerous oval cells five or six times as large as those of the ordinary parenclyma, containing a yellowish secretion. By the character of the medullary rays alone, the two barks are easily distinguished under the microscope.

I have not as yet been able to identify this bark externally; it presents some resemblance to that of *Ptelea trifoliata,* but the medullary rays in that bark, consisting of three or four rows of cells, are *filled with a series of sphœraphides,* which do not occur in the medullary rays of the false euonymus. The only other common species of euonymus, *E. Americanus,* has orange-red roots, and, therefore, could not possibly yield it.

The only suggestion that I can offer at present is that it may be derived from some Araliaceous or Rutaceous plant.

For some years past I have noticed that the euonymus of commerce varies in its activity, even when obtained from the same manufacturer, and the unrecognized occurrence of the false euonymus may possibly account for this difference. It has probably been in commerce for some years, as Greenish ("Materia Medica, 1899," p. 217) mentions that *the bark has occasional small transverse scars,* a statement which is copied by the author of "Pharmacopedia," p. 166. In any case, it will be advisable for pharmacists to give preference to *Euonymus atropurpureus* bark, which shows externally a longitudinally striated cork and a tangentially striatified liber (best seen under a good lens after wetting the transverse section with the finger), and delicate threads when gently broken transversely, and that shows the medullary rays, consisting of a single row of cells.

THE PREPARATION OF *N*/100 PERMANGANATE SOLUTIONS.

By J. O. Halverson and Olaf Bergeim.

The preparation, standardization and conditions of use in volumetric analysis of *N* and *N*/10 solutions of potassium permanganate have been studied with some care.[1] Unfortunately, however, certain of the precautions which have thus been shown to be necessary for accurate work have been commonly neglected in the literature, even in handbooks of general and applied analytical chemistry. As a result of this and of the widening application of permanganate titration methods, especially in biochemistry, certain methods based on this principle have been recently suggested which possess unnecessary inaccuracies. Common errors are the use of too much sulphuric acid in titrations and a lack of appreciation of the great sensitivity of permanganate solutions to traces of organic matter. In the determination of very small amounts of substance, as, for

[1] See Gooch's "Methods in Chemical Analysis," 1st Ed., New York. Reprinted from *The Journal of Industrial and Engineering Chemistry,* February, 1918.

example, in the estimation of calcium as oxalate in small portions of biological fluids[2] where permanganate solutions approximately *N*/100 must be used, the elimination of these sources of error is a necessity.

Where a standard permanganate weaker than *N*/10 was desired it has been customary to make this shortly before using by dilution of a stronger permanganate solution,[3] in spite of the fact that ordinary distilled water contains appreciable amounts of organic matter which can be removed only with great difficulty. For instance, we have found that water redistilled from both acid and alkaline permanganate may still cause an appreciable deterioration (as much as 2 or 3 per cent.) when used in diluting permanganate from *N*/10 to *N*/100. This was true even where the weak solution was used at once. If allowed to stand for any length of time, or if less carefully distilled water was used, the permanganate was almost entirely decomposed, this process being hastened by the catalytic action of the oxides of manganese which were formed.

To avoid the inconvenience as well as inaccuracy of dilution we have endeavored to prepare permanent *N*/100 solutions. The principle used is not new, but the technique as we have adapted it and some data pertaining to the keeping qualities of dilute permanganates and of oxalic acid solutions used as standards may be of interest.

PREPARATION OF *N*/100 POTASSIUM PERMANGANATE.

Dissolve 0.04 Gm. pure potassium permanganate crystals in one liter of redistilled water in a thoroughly clean Florence flask which has been rinsed with the same water. Digest at or near the boiling point for 36 hours. A funnel covered with a watch-glass may be used as a reflux condenser. Cool and allow to stand over night. Without disturbing the sediment of manganese oxides, filter with gentle suction through a 3-in. Büchner funnel lined with ignited asbestos. Both funnel and filter flask should be rinsed with redistilled water. Transfer the permanganate solution to a glass-stoppered bottle free from traces of organic matter. The solution should be kept in the dark when not in use. If the asbestos be-

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[2] Halverson and Bergeim, *J. Biol. Chem.*, 24 (1916), 22; 29 (1917), 337; Halverson, Mohler and Bergeim. *J. Am. Med. Assn.*, 68 (1917), 1309.

[3] See Michaelis, *Biochem. Z.*, 59 (1914), 166, and Ellinger, *Z. physiol. Chem.*, 38 (1903), 192, for example.

TABLE I.

Permanency of Permanganate Solutions, Etc.

No.	Solution.	Age of Solution.	Cc. Permanganate Required for Definite Volume Oxalic Acid.
1.	*N*/100 potassium permanganate	10 days	20.14
		25 days	20.20
		148 days	20.62
		185 days	20.65
		386 days	21.05
2.	*N*/75 potassium permanganate	2 days	11.88
		5 days	12.04
		15 days	12.15
2.	Separate bottle	2 days	11.81
		223 days	11.99
3.	*N*/50 potassium permanganate	1 day	8.14
		6 days	8.17
		19 days	8.25
		47 days	8.31
		68 days	8.45
		125 days	8.50
		180 days	8.55
4.	*N*/80 potassium permanganate (by direct dilution of *N*/10)	Theoretical	13.70
		15 minutes	14.20
5.	*N*/100 potassium permanganate (by direct dilution of *N*/10)	Theoretical	17.50
		15 minutes	17.83
6.	Same as Sol. 5	Theoretical	17.50
		15 minutes	17.81
7.	Same as Sol. 5	Theoretical	17.43
		15 minutes	17.69
		1 day	17.77
		2 days	18.18
8.	Oxalic acid 0.1101 Gm./100 C.C. (0.0175 normal)	1 hour	20.62
		18 days	20.58
		22 days	20.47
		72 days	18.06
9.	Oxalic acid, 0.1101 Gm./100 CC.	1 hour	20.54
		11 days	20.62
		14 days	20.62
10.	Oxalic acid, 0.1101 Gm./100 CC.	1 hour	8.34
		6 days	8.32
		10 days	8.30
		14 days	8.23
		19 days	8.27

comes clogged with oxides these may be dissolved out with hot concentrated hydrochloric acid, followed by washing with redistilled water without disturbance of the pad.

After standing two or three days this permanganate solution may be conveniently standardized against $N/50$ oxalic acid (0.1261 Gm. pure crystals to 100 Cc.) or sodium oxalate of similar strength. To 10 Cc. of the oxalic acid solution add 10 Cc. of 10 per cent. sulphuric acid which has been treated with just sufficient permanganate solution to give it a faint pink color. Place in a water bath at 65° C. for a few minutes. Then titrate at once to a definite pink color which persists for at least a minute. Correct for the blank obtained by titrating 10 Cc. of the sulphuric acid and the same volume of water to the same end-point.

If kept in a dark place, the oxalic acid solution used in standardization does not lose appreciably in strength in from ten days to two weeks. Ordinarily the permanganate solutions after they have stood several days will not vary over 0.1 per cent. per week (see Table I). On account of the sensitivity of the reagent it is, nevertheless, desirable to check it up rather frequently. This also serves as a control on technique.

The solutions on which the above data were obtained were kept away from the light except while in use. Solutions 1 and 3 were used almost every day. They were kept at room temperature throughout one summer and in the case of Solution 1 two summers. In the dilution tests redistilled water was used.

CONCLUSIONS

The preparation of weak permanganate solutions by direct dilution is inaccurate and inconvenient. By means of the procedure outlined in this paper $N/100$ potassium permanganate solutions may be prepared which will retain their strength and usefulness for an indefinite period.

THE GROUND-GLASS OBSESSION.[1]

Rumors continue to appear to the effect that ground glass has been found in food and that an investigation is to be made by the federal government. During the last two or three years we have passed through a whole series of such nation-wide "scares." Our readers may remember the vogue of infected court-plaster, of the insertion of various organisms into bandages and dressings, of the finding of numerous alleged bombs in different localities. To-day ground glass holds the stage. Just why any intelligent spy, or even an unintelligent German diplomat, should choose ground glass to kill off a community is problematical. Neither has any one explained how enemy sympathizers are going to avoid the alleged manipulated foodstuffs. In works on forensic medicine and toxicology ground glass is mentioned as a mechanical poison.

When the glass is coarsely ground it produces mechanical lesions of the lining of the gastro-intestinal canal which become infected. Ultimately the condition resembles a catarrhal and hemorrhagic inflammation. Both may result from perforation of the stomach or bowel, or from infection of the wounds and extension of the inflammation. A meal of very finely ground glass is regarded by some as harmless, and it has been reported that it is even used as a remedy among the peasants of eastern Europe. The concealing of ground glass in flour or in sugar, the two substances most commonly mentioned in the newspapers—any amateur psychologist can figure out why—would necessitate that it be ground very fine. These stories may have a certain value in keeping the public alive to the dangers of the spy peril. On the other hand, they stimulate cranks and other unbalanced persons to "go and do likewise," thus lending a substantial basis to the original imaginative stories.

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[1] From *The Journal of the American Medical Association,* March 23, 1918.

HOW TO MAKE B. I. P. P.[1]

Reference has been made in the *C. & D.* and *The Chemist and Druggist Diary*, 1918, to the composition and uses of B. I. P. P., devised by Professor Morison for treating infected war-wounds.[2] The inventor[3] now gives the details of the preparation, sterilization, and keeping of B. I. P. P. as worked out by Mr. Sidney Dunstan, chemist and dispenser to the Royal Victoria Infirmary, Newcastle-on-Tyne. The method adopted is as follows:

Iodoform	440 grams
Bismuth subnitrate	220 grams
Paraffin	220 grams
M. S. A.	

The bismuth and paraffin are sterilized by dry heat at a temperature of 120° C. for half an hour, and the bismuth after cooling is mixed with the iodoform in a mortar which has been sterilized by means of boiling water and formalin. The paraffin is added to the mixture at a temperature of 90° C. and thoroughly mixed, then put into specially made collapsible tubes with nozzle ends, holding 40 to 80 grams.

The paraffin used should be semi-solid, odorless, and tasteless, melting point 45° C., free from acidity and carbonizable organic impurities. The iodoform should be free from moisture, acids, and fixed impurities. It is also necessary that the bismuth be chemically pure, free from arsenic, and care taken in sterilizing that the temperature does not rise too high, otherwise nitrous fumes will be evolved. Should a paste be required of a softer consistency, the formula may be modified as follows:

Iodoform	440 grams
Bismuth subnitrate	220 grams
Paraffin base	220 grams
M. S. A.	

The paraffin base consists of

Paraffin, melting-point 45° C.	19 parts
Paraffin liq., sp. gr. 880	40 parts

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[1] From *The Chemist and Druggist*, February 23, 1918.

[2] American Journal of Pharmacy, March, 1918, p. 199.

[3] *British Medical Journal*, II., 1917, p. 503.

THE NEW REMEDIES OF 1917.[1]

By Thos. Stephenson, Ph.C., F.R.S.Edin., Editor of "The Prescriber."

Antiseptics.—The conditions of the past year make it natural that pharmaceutical advances should have taken place mainly along lines of military necessity, and, as a result, new antiseptics take a prominent place in the records of the year's progress.

For general use in the treatment of wounds, while numerous newer compounds have been advanced, the hypochlorous acid antiseptics still hold their ground. Eusol is still employed, but Dakin's solution, being less acid and more scientific in its formula, has perhaps a greater vogue in military surgery, especially now that the "Carrel method" is so largely in use. The original formula for Dakin's solution was given in *The Chemist's Annual.* The necessity for having a proper percentage (0.45 to 0.50) of hypochlorous acid, and the absence of caustic alkali being imperative, a more scientific method of preparation has been adopted. According to Carrel (*Jour. Amer. Med. Assoc.*, 1916, 67, 1777), the chlorinated lime must be accurately titrated with decinormal sodium thiosulphate. The percentage of active chlorine having been ascertained, the proportions of ingredients are determined by reference to a table, thus:

20 per cent. Cl. requires 230 Gm. chlor. lime; 115 Gm. Na_2CO_3; 96 Gm. $NaHCO_3$
23 per cent. Cl. requires 200 Gm. chlor. lime; 100 Gm. Na_2CO_3; 84 Gm. $NaHCO_3$
25 per cent. Cl. requires 184 Gm. chlor. lime; 92 Gm. Na_2CO_3; 76 Gm. $NaHCO_3$
30 per cent. Cl. requires 154 Gm. chlor. lime; 77 Gm. Na_2CO_3; 64 Gm. $NaHCO_3$

and so on, exact figures being given in the table for every percentage between 20 and 37. Anhydrous sodium carbonate is to be used; if the crystalline salt is employed 80 Gm. of dry salt must be replaced by 220 Gm. of crystalline salt.

To prepare the solution, the quantities are accurately weighed, and the chlorinated lime placed in a 12-liter jar with 5 liters of ordinary water, agitated for a few minutes, and allowed to stand overnight. At the same time the sodium salts are dissolved separately in another 5 liters of water. The sodium solution is to be poured all at once into the jar containing the maceration of chlorinated lime, the whole well shaken, and left to allow the calcium carbonate to settle as it forms. After half an hour the supernatant liquid is siphoned off and filtered through paper.

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[1] Reprinted from the *Pharmaceutical Journal and Pharmacist,* February 23, 1918.

Verification of strength should be made from time to time by means of decinormal sodium thiosulphate; 10 Cc. of the solution should require from 12 to 13 Cc. of the thiosulphate, equivalent to 0.45 to 0.50 per cent. of sodium hypochlorite. A simple method for the preparation of *eusol* is described. Stock solutions of liquor calcis chlorinatæ, B. P., and boric acid (4 per cent.) are used, 135 Cc. of the former being diluted to 750 Cc., and 250 Cc. of the boric acid solution added. This gives a liter of solution of the desired strength; should it be required for intravenous injection, 8.5 Gm. of sodium chloride dissolved in 250 Cc. of water is added in place of portion of the water used to dilute the chlorinated solution.

A solution of hypochlorous acid suitable for wound treatment may be produced by the passage of electricity through normal saline. If sea water be substituted for normal saline, a powerful disinfectant is produced, and this process has been adopted on board hospital ships with much success.

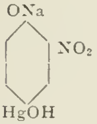
The "Carrel method", of employing hypochlorous antiseptic solution has been so widely used, and is so frequently referred to, that a word or two regarding it may be given here. This method consists essentially of three operations: (1) thorough opening up and cleansing of the wound; (2) continued irrigation, by suitable apparatus, with Dakin's solution or chloramine-T solution; (3) regular bacteriological control by examination of smears from the wound. The irrigation is given through fenestrated rubber tubes, resembling drainage tubes, and closed at one end; these are connected with a branched glass tube, which in turn is connected with a glass reservoir containing the antiseptic. The bacteriological examination is made every second day, the results being entered on a suitable chart, and when organisms are absent from the wound on three successive days, the wound is regarded as sterile. There seems little doubt that the Carrel method has come to stay—for the duration of the war at least.

A development of Chloramine-T or sodium para-toluene sulphochloramide has been effected in *Dichloramine-T,* which is toluene parasulphodichloramine. Chloramine-T being insoluble in liquid paraffin, it was impossible to use it as a nasal spray in this medium. Dichloramine-T, however, is soluble in eucalyptol, and this solution can be diluted with liquid paraffin so as to make a nasal spray. As both eucalyptol and liquid paraffin have an affinity for chlorine, with consequent decomposition of the dichloramine-T, the oils must previously be chlorinated by treatment with potassium chlorate and hydrochloric acid. The nasal spray is prepared by dissolving dichloramine-T, 0.2 Gm., in chlorinated eucalyptol, 2 Cc., adding liquid paraffin, 8 Cc., and mixing. As soon as a precipitate shows itself the solution should be discarded. A stock solution containing 10 per cent. in eucalyptol may be made, and this diluted with liquid paraffin, 1:4, as required. This stock solution will keep for a month. Oily solution of dichloramine-T has also been used as a spray and as a dressing for wounds.

A better solvent for dichloramine-T has just been announced by Dakin and Dunham (*B.M.J.*, Jan. 12, 1918). Ordinary hard paraffin is melted in a flask, and chlorine gas passed through it, at suitable temperature, to saturation. The product is an oily substance, which, when treated with sodium carbonate and filtered, gives a clear yellow oil slightly heavier than water. This oil, which the authors propose to call *Chlorcosane,* will dissolve 10 per cent. of dichloramine-T, the solution being practically stable if kept in amber bottles.

The use of aniline dyes as antiseptics has made some progress. *Brilliant Green* (see *The Chemist's Annual,* 1917, p. 46) has been further investigated, while a new, or rather, a resuscitated, compound, *Flavine,* or diamino-methyl acridinium chloride, has come into prominence. Flavine has since been known as *Acriflavine,* and another and similar acridine compound, *Proflavine* (diamino-acridine sulphate), which is cheaper to prepare, has also been introduced. More recent researches have cast some doubt on the real value of these compounds as antiseptics, it being held in some quarters that the methods of the early investigators were faulty and their deductions unreliable; whether or not these contentions will be upheld remains to be seen.

A new mercurial germicide has been introduced by *Schamberg* (*Jour. Amer. Med. Assoc.*, 1917, 68, 1458) under the name of *Mercurophen.* This is sodium oxymercury-orthonitrophenolate; it contains 53 per cent. of Hg, and its formula is as shown below. It is an odorless brick-red powder, freely soluble in water, giving a yellow solution. It is said to be thirty times as powerful as mercuric chloride, with only about one fifth its precipitating power on serum proteins. Solutions of 1:5,000 have no tarnishing effect on instruments, and its toxicity is much lower than that of mercuric chloride.



Acetozone, which is a mixture of benzoyl-acetyl peroxide with an inert powder, is not new, but its use has been confined to that of an intestinal antiseptic. It has now been found to be of service in military surgery as a dressing for wounds. It is non-toxic and innocuous to the tissues; its solutions are colorless and do not stain, and its action is rapid.

Among other antiseptics that have received favorable comment are *Bacterol,* a formaldehyde-iodine compound, and *Yadil,* described as a trimethenal allylic compound. The former is issued in several forms, according to the use for which it is intended, while the latter claims to be absolutely non-toxic—so much so that it can be given internally in teaspoonful doses.

An important pronouncement regarding antiseptics was made early in the year by Kenneth Taylor, who declares that just as each disease requires its own specific drug, so each organism can be controlled only by its own specific antiseptic. This specificity of antiseptics opens up an immense field for research, and if confirmed will do away once for all with the idea of a general antiseptic for all purposes. It will also account for the varying reports received from different quarters regarding certain antiseptic substances.

Bismuth-iodoform-paraffin paste, or *"Bipp,"* has now many advocates. Its use in wound treatment has spread considerably during the year. The paste consists of bismuth subnitrate, 1; iodoform, 2; liquid paraffin, q.s., and it is applied freely to the wound, which is entirely filled with the paste and dressed with sterile gauze. In preparing "Bipp" great care must be taken to ensure freedom from grit.

PARAFFIN TREATMENT OF BURNS.—The use of a French proprietary called *Ambrine* was announced comparatively early in the war. Ambrine is a preparation of hard paraffin, containing, some say, resin and oil of amber. When melted and applied to burns or wounds, it forms an air-tight coating under which the lesion rapidly and completely heals. Its success was undoubted, and it was not long before investigations were afoot with a view to ascertain the *rationale* of its action, and, if possible, to discover an effective and inexpensive substitute for use on a large scale. Ordinary paraffin was not sufficiently plastic when applied to the skin, and attempts to mix resin with it failed, owing to separation of the resin when the mixture was heated. It was found, however, that when hard paraffin was heated to 130° C. by means of super-heated steam, some molecular change took place, the melting point was reduced several degrees, and the substance took on properties similar to ambrine. This paraffin, with the addition of certain antiseptics, is known officially as "No. 7 Paraffin," and its formula is: Resorcin, 1 (or beta-naphthol, 0.25); oil of eucalyptus, 2; olive oil, 5; hard paraffin, 67; soft paraffin, 25. The method of application is as follows: The burn is washed with sterile water, and carefully dried; a layer of melted paraffin is then painted on, and covered with a thin layer of cotton wool; a second layer of melted paraffin is applied over that, and the whole covered with wool and a bandage. The dressing is changed daily at first, later every second day.

It was not long before a number of ambrine substitutes appeared on the market: *Ambryl, Cerambine, Parakao, Parresine,* etc., are examples of these. A mass of literature has appeared regarding this treatment, and the result of further investigaiton to date has brought out several facts. First, pure hard paraffin, of suitable melting point, is superior to any mixture, the addition of wax or resin being unnecessary. Second, the pain caused by the first application may be obviated by substitution of liquid paraffin for melted paraffin for the first coat. Third, if antiseptics or anæsthetics are to be added, these should be incorporated with the liquid paraffin used for the first application, and not with the hard paraffin. The paraffin method has been an undoubted success; it is clean, simple, inexpensive, and efficient, and, if liquid paraffin be used as the preliminary application, practically painless.

Dealing with the use of antiseptics in connection with the paraffin treatment, Hull (*B.M.J.,* Dec. 15) finds that the best method is to paint the burn with a solution of an antiseptic before applying the paraffin. The best antiseptic is, he finds, acriflavine, a solution of 1 : 1,000 being used. He also gives the following formulæ:

No. 7 Paraffin.—β-naphthol, 0.25; eucalyptus oil, 2.0; olive oil, 5.0; soft paraffin, 25.0; hard paraffin, 67.75.

No. 10 Paraffin.—Scarlet red, 0.2; eucalyptus oil, 2.0; olive oil, 5.0; hydrous wool-fat, 4.0; soft paraffin, 21.0; hard paraffin, 67.8.

No. 11 Paraffin.—As No. 10, at the expense of the soft paraffin.

No. 12 Paraffin.—As No. 7, but with brilliant green, 0.05 per cent.

No. 13 Paraffin.—As No. 7, but with flavine, 0.2 per cent.

No. 14 Paraffin.—As No. 7, but with dichloramine-T, 0.2 per cent.

In the *Jour. Amer. Med. Assoc.*, 1917, 69, 1525, appears a description of the paraffin required for film treatment known as "surgical paraffin," or "plastic paraffin." It is required to be more ductile and pliable than the official (U. S. P.) paraffin, and to be liquid at or below 50° C. A thin film, when prepared and tested as described below, should be pliable at or below 28° C. and ductile at or below 31° C. At body temperature it should be pliable, and adhere to, but permit ready detachment from the skin.

Test.—The pliability and ductility of paraffin are determined as follows: A little of the melted substance is poured on water having a temperature of about 40° C., so as to form a number of separate films. The temperature of the bath is then gradually lowered by the addition of cold water to determine the pliability and ductility. The film while immersed in water is doubled on itself and the temperature of the water observed at which the film breaks sharply on *one* fold (pliability test). The film is stretched while under water, and the temperature of the water noted at which the film breaks sharply and evenly (ductility test). A small surface of the forearm is painted with melted paraffin, covered with a thin layer of cotton, another coat of paraffin painted on the cotton; and then dressed with cotton and bandage. After one hour the film should remain attached to the skin, showing it is adherent, but be easily removable.

(*To be continued*)

PHILADELPHIA COLLEGE OF PHARMACY.

Minutes of the Annual Meeting.

The annual meeting of the Philadelphia College of Pharmacy was held March 25, 1918, at 4 P.M. in the Library.

The President, Howard B. French, presiding.

The minutes of the quarterly meeting held December 31, 1917, and the special meeting held January 2, 1918, were read and approved.

The minutes of January 4, the memorial service for Professor Joseph P. Remington were not read, as they had been fully published in the AMERICAN JOURNAL OF PHARMACY, Volume 90, pages 79–107.

The minutes of the Board of Trustees for December, 1917, January and February, 1918, were read by the Registrar, J. S. Beetem, and approved.

President French then read his Annual Address. It was quite lengthy, giving in detail the activities of all the departments of the College. It was listened to attentively and hearty applause was given at its close. Mr. England moved that the address be referred to the Committee on Publication to abstract such portions for publication in the AMERICAN JOURNAL OF PHARMACY that would be of the greatest interest. So ordered. See this JOURNAL, pages 380–386.

Professor Lowe for the Committee on Pharmaceutical Meetings reported verbally that there had been no meetings held during the year. The meetings of the Philadelphia branch of the American Pharmaceutical Association had largely taken over the subjects formerly discussed. Nevertheless the Committee on Nominations deemed it best to continue the existence of the committee as conditions might arise in the future which would make it desirable to hold these meetings as formerly, and so had placed in nomination a list of names to be acted on at the annual election.

The Committee on Necrology reported the names of deceased members during the year. As obituary notices had been published previously the names are only reported at this time as a part of the proceedings of the annual meeting.

Fred F. Mueller died at Los Angeles, June 29, 1917.

Doctor Charles T. George died at Harrisburg, December 26, 1917.

Joseph P. Remington died at Philadelphia, January 1, 1918.

REPORT OF THE CURATOR, JOSEPH W. ENGLAND.—The museum is in good condition and has received a number of valuable accessions during the year. A number of specimens have been rearranged to better advantage. Professor Youngken states that he has undertaken the better classification of the college herbarium according to the widely recognized system of Engler and Prantl. Some suggestions are also made to greatly facilitate reference to the collection. It is also recommended that the cases in the museum be lettered and the contents be card-indexed, and an inventory be made of all the articles in the museum.

The report was discussed by Mr. Beringer and ordered referred to the Committee on Museum with power to act.

REPORT OF THE ACTING EDITOR OF THE AMERICAN JOURNAL OF PHARMACY.—The events of the past year have placed upon the acting editor the responsibility of making an annual report covering largely the work of others. As his service, in this capacity, began with October and had only to do with the last two monthly issues of the 89th volume, he fears that you may have to pardon the omission of much of the usual details of preceding reports of the editor. The withdrawal of the editor during the year, and the decease of such prominent members of the Committee on Publication as Dr. M. I. Wilbert and Professor Joseph P. Remington, have made gaps which it is difficult to fill.

The 89th volume of the AMERICAN JOURNAL OF PHARMACY was issued in the regular monthly numbers during the year 1917. It has maintained fully its position as the ethical pharmaceutical journal of America, in which is recorded the best work of pharmaceutical and allied investigators in a permanent form for study and reference. The number of pages printed in this volume has been somewhat in excess of that in recent years and may be exceeded even more in the present year.

More than seventy original papers have been published during the year, covering a very wide range of topics. This number is exclusive of book reviews, obituary notices, trade interest notes, etc., which have been continued throughout the monthly numbers as usual. In addition many articles have been reprinted or abstracted from other publications. The meetings of the College and of various pharmaceutical and drug trade organizations have likewise been reported in its pages. The value of the original papers that have been published in the JOURNAL is shown by the frequency with which they are republished and referred to in our contemporaries.

The papers and many of the reprinted articles exhibit the spirit of the time and the existing conditions under which not only the policies, history and boundaries of many nations are being revolutionized, but likewise the scientific methods and professional practices are being recast. This gigantic war has introduced numerous new problems in medicine, surgery and pharmacy and the space available in the JOURNAL is being taxed to properly present these to our readers. The importance of these demand the fullest detailed statements possible and the widest circulation of the information so that pharmacists may be prepared to creditably meet their share of the nation's great responsibilities.

The JOURNAL naturally reflects the viewpoint of the editor as to the needs of the time and of the interests the JOURNAL serves and in the selection of material for publication his personal judgment may at times be at fault. Several innovations have already been introduced, such as the monthly editorial column and the extended abstracts from current literature. These appeared to be in the line of duty and from the editor's viewpoint desirable, but he has been endeavoring to gauge the opinion of the readers of the JOURNAL as to the acceptability of these and the possibility of introducing other innovations that are considered as features of modern journalism, without in the least affecting the scientific standing of the publication.

The business manager is giving good service to the advertising clientele and his efforts are being devoted to improve the pages that are assigned to trade offerings and the wants of druggists and manufacturers and doubtless this will prove beneficial to the advertisers as well as to the JOURNAL. The introduction of "Classified Advertisements" opens up an avenue that should appeal alike to employers and employees and which should be well patronized as valuable to both.

The coöperation established between the editorial and business management is beginning to show results in the increased number of subscribers and some additional advertisements and as the systematic work progresses, it is our hope that this will redound more effectively to the betterment of the JOURNAL, increase its value as an advertising medium for standard wares and above all extend its usefulness to the Philadelphia College of Pharmacy and to the advancement of pharmacy, the one common interest to which we all subscribe.

REPORT OF THE COMMITTEE ON PUBLICATION.—Read by Professor Samuel P. Sadtler.

This report is largely a statement of receipts and disbursements for the year, also a statement as to the number of subscribers, full paid and others. Students are privileged to secure the JOURNAL at the nominal price of $1.00 per year and a large number of the students are subscribers. The "Remington Memorial Number" of the JOURNAL was an unusually large edition, owing to the fact that it was mailed to each one of the alumni of the college. An appropriation was voted by the College for the use of the Publication Committee.

Report of the Librarian was presented by Miss Katharine E. Nagle. There have been 214 accessions this year, which brings the number of volumes belonging to the library up to 14,675. There are also several thousand pamphlets accessible. The use of the library for the year was by students 3,103 times, professors 163 times, public 103 times, a total of 3,369 persons.

Report of the Committee on Nominations was read by the Secretary, when the President appointed Mitchell Bernstein, E. H. Hessler and Charles F. Liebert to conduct the election for officers, trustees and committees.

In this connection Mr. Beringer stated that he had not been consulted as to placing his name on the list of nominees for the position of editor. When he accepted the position of acting editor when Professor Kraemer resigned he considered it only a tentative arrangement, and he desired it to be known that he wished the College to be free to elect some one else as editor at any time. He realized there was too much demand on his time and services, and it was a serious question with him as to what to give up or retain to preserve his health. He would give to the position on the Journal the best that he could, but would relinquish it at any time in favor of any one the College would select.

Election.—Professor Stroup moved that in the election for trustees those receiving the highest votes should be for the three years term, the next highest vote for the two years term, and the next highest vote for the six months term. Agreed to.

Report of the Committee on Membership.—While the tellers were counting the ballots this was read by Professor Stroup.

When, after the death of Professor Remington, it was decided to make the February number of the American Journal of Pharmacy a "Remington Memorial Number" it occurred to Professor E. F. Cook that it would be a good idea to send a copy to each alumnus of the College, and, at the same time, make an appeal for him or her to become a member of the College. The idea met with the approval of the President of the College and other members of the Board of Trustees and we were authorized to go ahead. Accordingly there were mailed a few weeks ago to the alumni not already enrolled as members of the College a copy of the Journal and literature bearing on securing prospective students' names, the code of ethics of the College and a personal appeal to join the College.

To date the results of the campaign have been as follows:

First, the receipt of a considerable number of names of prospective students.

Second, the receipt of several hundred cards containing more or less brief autobiographies of alumni.

Third, the receipt of data enabling us to correct the addresses of about a hundred of the alumni.

Last, and probably most important, the receipt of more than eighty applications for membership in the College, one for life membership, about two thirds for active membership, and the remainder for associate membership. These applications will be presented to the next meeting of the Board of Trustees, and can be acted on one month later.

Professor Moerk suggests that a list of the members of the College be posted in a readily accessible place in the library, or a card index list of names and addresses of members be prepared.

COMMITTEES AND DELEGATES APPOINTED.—The President made the following appointments:

To membership on the Combined Committee on Centenary and Historical Committee to fill vacancies by death and removal: Walter A. Rumsey, Joseph W. England and J. W. Sturmer.

Committee on By-Laws: George M. Beringer, Joseph W. England, C. A. Weidemann.

Delegates to the meeting of the Pennsylvania Pharmaceutical Association: Charles H. LaWall, F. P. Stroup, F. X. Moerk, E. F. Cook, J. W. Sturmer, O. W. Osterlund, John K. Thum.

Delegates to the meeting of the Delaware Pharmaceutical Association: Dr. A. W. Miller, Dr. C. B. Lowe, H. J. Watson, S. L. Foster.

Delegates to the meeting of the New Jersey Pharmaceutical Association: Dr. C. B. Lowe, George M. Beringer, Charles H. LaWall, J. W. Sturmer, H. W. Youngken.

Professor Stroup, on behalf of Mrs. Maisch, presented some colored lantern slides and cuts that had been used in published papers by Professor John M. Maisch, and on motion they were accepted and the thanks of the College voted to Mrs. Maisch.

Bill of J. E. Soule for engrossing the memorial resolutions to Professor Remington was presented and ordered paid.

The tellers having concluded their count reported the election of President, Howard B. French; First Vice-President, R. V. Mattison, M.D.; Second Vice-President, Joseph L. Lemberger; Treasurer, Warren H. Poley; Corresponding Secretary, A. W. Miller, M.D.; Recording Secretary, C. A. Weidemann, M.D.; Curator Joseph W. England; Editor, George M. Beringer; Librarian, Katharine E. Nagle.

Trustees: R. M. Shoemaker, W. A. Rumsey, J. M. Baer, Ambrose Hunsberger, Otto Kraus.

Publication Committee: Samuel P. Sadtler, Joseph W. England, Charles H. Lawall, George M. Beringer, John K. Thum, J. W. Sturmer, R. P. Fischelis.

Committee on Pharmaceutical Meetings: C. B. Lowe, M.D., George M. Beringer, Charles H. Lawall, E. Fullerton Cook, John K. Thum.

Whereupon the President declared them duly elected.

Letters of condolence on the death of Professor Remington were read from the University of Havana, Cuba, Dr. Gabriel Casuso, Rector (President), The Liverpool Chemists' Association, David H. Evans, Honorary Secretary, and "The General Medical Council of the United Kingdom," Sir Donald MacAllister, President.

These letters were referred to the Editor of the JOURNAL.

After these letters had been read Mr. Beringer expressed regret that these communications and some others had not been received in time to be inserted in the memorial number of the AMERICAN JOURNAL OF PHARMACY or in the memorial pamphlet that had been prepared, and asked the opinion of the members as to the distribution of the pamphlet. His own view was they should be sent to the members of the College, the Committee on Revision of the Pharmacopeia, and friends of Professor Remington and of the College; after some discussion it was voted to distribute them as Mr. Beringer had suggested.

C. A. WEIDEMANN, M.D.,
Recording Secretary.

ABSTRACTS FROM THE MINUTES OF THE BOARD OF TRUSTEES.

December 4, 1917. Committee on library reported 9,269 books accessioned and 7,471 books catalogued. A number of gifts were received and a number of purchases made. 343 persons used the library during the month.

Committee on instruction reported that several meetings had been held to consider corrections and amendments to the Pharmaceutical

Syllabus. Also to consider the advisability of a special course (to be given as a postgraduate course after the College session) covering training suitable for pharmaceutical, sanitary and hygienic practice in the Army, and to ask the Board of Trustees for their approval.

The faculty generously tendered their services for the course, hoping by so doing to aid the government as well as the profession of pharmacy. On motion the action of the committee was approved.

Committee on scholarships. The chairman stated that the committee should be enlarged by associate membership, and asked that Professors Moerk, Sturmer and LaWall be added as associate members. It was so ordered.

Committee on examinations reported that Donald W. Huber, P.D., and Percy D. Neeld had completed the full course in technical chemistry and having passed their examinations were entitled to receive the certificate of proficiency in chemistry. On motion it was ordered that certificates be granted to them.

The committee also reported that Everett J. Roberts had completed a special course in the analysis of fuels, oils and water, covering one thousand laboratory hours and one hundred and twenty lectures and is, therefore, entitled to a special certificate. On motion a special certificate was granted.

By invitation, Prof. Sturmer appeared before the Board to give his views regarding the desirability of considering at the present time the names of a number of students who had completed their scholastic requirements last June and had since presented satisfactory evidence of completing four years practical work as being eligible for a degree of Ph.G. and not to hold them over until June, 1918. After some explanation and discussion, it was voted that these students be declared graduates and that they should receive their diplomas at the next commencement.

The Secretary of the Board announced that he had received letters of appreciation from the recipients of scholarships.

The committee on membership reported favorably on the application of Anton Hogstad, Jr., for associate membership. A ballot was taken and he was unanimously elected.

January 2, 1918. Fourteen members were present.

Mr. French moved that the usual course of business be suspended out of respect to the memory of our late Dean and that the meeting adjourn to meet Tuesday, January 8. It was so ordered.

On motion, it was ordered that the College be closed Friday, January 4, except for the memorial services which were to be held at 3 o'clock in the afternoon.

Notices were ordered to be sent to the membership of the College and to the alumni stating that the funeral services of Professor Remington would be held at Holy Trinity Church, Friday, January 4, at 1 P.M. and that a memorial service would be held at the College at 3 P.M.

January 8, 1918. Committee on property reported some trouble with frozen pipes, which were being repaired.

Committee on library reported the use of the library during the month by 311 persons.

Committee on examinations presented the names of two persons for the honorary degree of Master in Pharmacy. According to the By-Laws these names were referred to a special committee to report at the next meeting.

The committee further reported on matters relating to marks necessary for graduation and other matters in connection with the examination that had been considered at a meeting recently held by the heads of the departments.

Mr. Cliffe referred to Mr. Beringer's accident and moved that the Secretary be directed to convey to him the sympathy of the members of the Board and express their good wishes for his early recovery.

Applications from four persons for active membership and one for associate membership were referred to the committee on membership.

The committee on membership reported favorably upon the application of Prof. Jose P. Alacan, of Havana, Cuba, and Edgar A. Sparks, Burlington, N. J. A ballot was taken and they were duly elected.

The Secretary read a communication from Mrs. Joseph P. Remington expressing appreciation of the flowers sent by the Board of Trustees.

February 5, 1918. The Chair announced that the usual order of business would be suspended in order to receive a communication from the faculty. Dr. S. P. Sadtler as chairman of the faculty presented the following report:

The members of the faculty met on February 2 and February 5; Dr. Sadtler presided at both meetings. It was unanimously decided that Professor Charles H. LaWall be elected as dean of the faculty to fill the vacancy caused by the death of Professor P. Remington.

It was also unanimously decided that the offices of dean of the food and drug course, associate dean, and assistant dean be abolished, and that there be created the office of dean of post-graduate and special courses, which position should be filled by Professor Julius W. Sturmer, who with Professor Charles H. LaWall and Professor Frank X. Moerk, director of the technical chemistry department, shall constitute the executive officers of the faculty.

The report was received and the recommendations taken up seriatim:

First, that Professor Charles H. La Wall be elected as dean of the faculty. Approved.

Second, that the offices of dean of the foods and drug course, associate dean and assistant dean be abolished. Approved.

Third, that the office of dean of the post-graduate and special courses should be created and that Professor Julius W. Sturmer be made dean of same. Approved.

Fourth, that Professor Frank X. Moerk be made director of the technical chemistry department. Approved.

Fifth, that Professors LaWall, Sturmer and Moerk constitute the executive officers of the faculty and that they have the necessary clerical assistance. Approved.

The dean-elect Professor LaWall, Dr. Sturmer and Prof. Moerk were later invited to be present at the meeting.

Committee on library reported that 570 persons had used the library during the month.

A communication was received from Chairman Beringer, containing a number of recommendations and suggestions. After the reading of the communication, Mr. England moved that they be considered seriatim. It was so ordered.

First, to fill the chair of professor of theory and practice of pharmacy, Professor Sadtler nominated Professor Charles H. LaWall.

Second, to fill the chair of operative pharmacy and director of the pharmaceutical laboratory, Mr. Cliffe nominated Professor E. Fullerton Cook.

In accordance with the By-Laws, these nominations lay over until the meeting of the Board in March.

Third, that in the future the executive officers of the faculty be invited to attend the meetings of the Board of Trustees (except such as may be deemed strictly executive) in order to advise with the Board, but without the privilege of voting. Approved.

The Chair congratulated Professor LaWall upon his election as dean of the faculty and Professor Sturmer as dean of the post-graduate and special courses, both of whom expressed their appreciation of the honor conferred upon them and their intention to further the interests of the College.

Fourth, the suggestion relative to the elimination of the degree of Doctor in Pharmacy (Phar.D.) for the three-year course and hereafter maintaining the degree of Doctor in Pharmacy for students who will carry on two years of higher study and research work after completing the course for the degree of B.Sc. in pharmacy was discussed. It was then moved that the degree of Doctor in Pharmacy (Phar.D.) be eliminated hereafter for a three-years course, with the understanding that students who had already matriculated for the course leading to this degree (Phar.D.) would be continued in this course for the degree as announced in the previous College Bulletin. It was so ordered.

Committee on examination reported that Maurice Blumberg and Maurice B. Dadney, who had passed their examinations for the degree of Ph.G. just previous to the last commencement, but who were deficient in practical experience, have submitted evidence as to the completion of that requirement and are now eligible for a diploma. On motion they were declared Graduates in Pharmacy.

The special committee to whom was referred the names proposed for the honorary degree of Master in Pharmacy reported through Dr. A. W. Miller, chairman, that they cordially and unanimously approved of the names that had been presented. Thereupon a ballot was taken and being clear the Chair declared Prof. E. Fullerton Cook, of Philadelphia, and Otto Raubenheimer, of Brooklyn, N. Y., elected to receive the degree of Master in Pharmacy (Ph.M.) Honoris Causa.

Mr. French read a communication from the Provident Life and Trust Company containing a copy of the eighth item in the will of the late Prof. Joseph P. Remington, covering a bequest to the College. Mr. French also read his reply acknowledging receipt of this information.

Communications were read from Mr. Benjamin T. Fairchilds, Professor Jose P. Alacan, the Cuban Branch of the American Pharmaceutical Association and Dr. Carl Alsberg, of the Department of

Agriculture, conveying personal expressions to the memory of Professor Remington.

A communication was read from the Secretary of the National Pharmaceutical Service Association asking for space in the library where, with the assistance of a stenographer, the work of the Association could be efficiently carried on. The request was granted in accordance with President French's reply to same.

Committee on membership reported favorably upon the application of Lawrence K. Boehme, of Germantown, O., Ralph R. Foran, Charles H. Fowler and Horace J. Hallowell, of Philadelphia, for active membership, and Dr. John H. Mills, Tampa, Fla., for associate membership. A ballot was taken and, being clear, they were duly declared elected to membership in the College.

ABSTRACTS FROM THE ANNUAL ADDRESS OF PRESIDENT HOWARD B. FRENCH.

Shortly after your last annual meeting, the United States was called upon to take aggressive action in the world's war in support of democracy and the freedom of the seven seas. To the credit of your honored institution it should be noted that 307 alumni and members of the college classes tendered their professional services to the United States government, through your President. After numerous interviews it was found that although a very large number of vacancies for pharmacists existed in the United States Army and Navy, it was necessary for those who wished to enter as pharmacists to enlist in a minor position, and with no prospect of advancement to commission rank.

Those actively interested in the College felt that the time had come to make an earnest effort to have a pharmaceutical corps established in the United States Army, and they have supported the National Pharmaceutical Service Association, which organization was formed for the specific purpose of improving pharmaceutical service in the departments of the government and obtaining proper recognition and rank for professional pharmacists in government service. A bill providing for a Pharmaceutical Corps in the United States Army was introduced in Congress by Hon. George W. Edmonds, one of your alumni. The bill, known as H. R. 5531, has received the endorsement of the College and a committee represented this College at the hearing held thereon in Washington by the Military Committee of the House. It is the hope of a large majority of the medical and the pharmaceutical professions that this bill may be enacted so as to extend further care to the boys of our families who are fighting in support of the democratic freedom of the world. They deserve it and should have it and it is the hope of your President that all will use their earnest efforts with their representatives in Washington to have the Edmonds Bill enacted into a law at the earliest possible date. To-day we have a record of something under 200 of our alumni who are serving in defense of their country, and if proper recognition is given by the government to our profession, it is reasonable to suppose that hundreds more will tender their services to aid in alleviating the pain and distress of our soldiers at the front.

Through the liberality of the University of Pennsylvania and the concurrence of the city of Philadelphia, your College last summer was able to secure many thousand dollars worth of material and fixtures, formerly in the pharmaceutical department of the Medico-Chirurgical College, much of which has already been used in the microscopical, pharmaceutical and bacteriology laboratories and other parts of your buildings and the balance has been stored for future service.

Your entire plant is in fairly good condition and while it would be desirable to make some improvements, your committee on property feels that they would not be justified, at the present time, in making any improvements that could possibly be done without.

Last year seven courses of instruction were given and this year there are eight courses for which diplomas are given. Also a three years' course in analytical and industrial chemistry and a special course in bacteriology for which certificates are given.

Your Board of Trustees has recently eliminated the Phar.D. degree for three-year course except for those students who enrolled for the session 1917–1918 and in future this degree will be awarded only to those who continue their post-graduate study and the higher research work to be required for the doctorate degree.

Your Board of Trustees recently approved of several spring courses to cover the period from May 20 to June 29. The instruction is to be given by the present members of the faculty, who, with their usual coöperation and liberality, have consented to take charge without additional compensation. The courses will consist of clinical and sanitary analysis, microscopy of foods and drugs, laboratory course in bacteriology, lectures and demonstrations in first aid and bandaging. The prime object of this instruction is to fit men for better service in the medical department of the Army and Navy.

Your President feels that you will be gratified to learn that the misunderstanding which has existed between the state of New York and your institution for some years has been adjusted to the satisfaction of both parties and he hopes that no further cause for misunderstandings will arise in the future.

The war and conditions incident to same has caused a material falling off in the attendance of students, although we are pleased to report that the decrease in attendance is a little less than the average of similar institutions and universities in the United States.

We have 369 students attending the College at the present time, 6 of these are taking the B.Sc. course (5 second-year and 1 first-year student) and 15 students from the first and second years are taking a course in bacteriology.

DEPARTMENT OF PHARMACY.—Prof. Charles H. LaWall has been elected professor in theory and practice of pharmacy and under his able management the department has shown marked progress. The work has been given along the same general lines as in former years; however, to keep the subject matter fully up to date caused a few minor changes to be made in the method of conducting the lectures and quizzes.

PHARMACEUTICAL LABORATORY.—Prof. E. Fullerton Cook has been elected professor of operative pharmacy and director of the pharmaceutical laboratory. The instruction in this department has been fully up to the standard during the past year.

In the post-graduate classes instruction has been introduced with the intention of qualifying these students as managers and "control men" in manufacturing laboratories, or as expert manufacturers in the retail stores. This work has covered the strictly pharmaceutical, with the necessary understanding of standardization by assay and also specialized manufacturing such as perfumes, cosmetics, dentifrices, etc. It also includes careful work in sterilization, disinfection, war antiseptics, and a thorough review of the latest and best methods in prescription dispensing.

Your professor of operative pharmacy has made a suggestion which seems to your president to be most desirable. He asks that the members of your Board of Trustees who are actively engaged in conducting retail drug stores hold a conference at least once a year with the instructors of the pharmaceutical laboratory to go over the plan of instruction and to offer suggestions which in their opinion would increase the practical efficiency of the students.

CHEMICAL LABORATORY.—The chemical laboratory has as usual been most active during the present session. There have been 122 first-year students, 145 second-year students, 6 Phar.D. students, 8 Ph.C. students, 6 B.Sc. students (1 first-year and 5 second-year) and 26 special chemistry students, making a total of 313 students taking advantage of instruction in this department.

DEPARTMENT OF BOTANY AND PHARMACOGNOSY.—Since the last annual meeting, your former professor of botany and pharmacognosy tendered his resignation, which was accepted by your Board of Trustees, and his assistant, Heber W. Youngken, was placed in charge of the department and it is gratifying to report that his efforts in the department have been most satisfactory.

He has had a number of changes made in the laboratory, and his laboratory is now in splendid condition and most conveniently arranged for the instruction of the student body and it is particularly adapted for research, post-graduate and special students work.

The college herbarium is being rearranged and its numerous specimen sheets are being classified according to the Engler and Prantl System. This work is extremely slow, but with the earnest and active efforts of the professor, the herbarium will be placed in satisfactory condition.

The professor has collected a large variety of seeds of medicinal plants which he is germinating for use in the hothouse and roof garden. He also has secured a variety of medicinal plants from the botanical garden of the University of Pennsylvania and the Bureau of Plant Industry at Washington, which as soon as the weather will permit will be transferred to your roof garden.

Your President desires to again express the hope that the city or state will in the near future see the desirability of arranging for a botanical garden under the control of your College so as to assist the educational institutions in Philadelphia in the advanced study of botany and pharmacognosy.

DEPARTMENT OF BACTERIOLOGY.—Professor John A. Roddy, in charge of this department, was among the first to tender his services to the government, and was early sent to Fort Slocum and afterwards to Camp Dix, from which place he has been ordered to a western post. In all of these positions he has been most active and efficient.

During his absence the department has been placed in charge of Assistant Professor Louis Gershenfeld.

He has asked for increased facilities to accommodate the increasing number of students, and your committee on property has now under consideration the placing of additional tables in this laboratory, together with the fixtures and reagents requisite.

DEPARTMENT OF MATERIA MEDICA.—The professor in charge of this department reports satisfactory results in every way. His assistant, Dr. Mitchell Bernstein, who fills the vacancy caused by the resignation of Dr. Alfred Heineberg, due to the demands of his large medical practice, has shown himself well fitted for the position.

A physical examination of all students coming into the College was made at the beginning of the term. As a result of this, six applicants were found to be in a physical condition that did not justify their taking the College course and some of the others were instructed as to physical defects or needed reforms in their mode of life.

DEPARTMENT OF CHEMISTRY.—Professor Freeman P. Stroup, recently elected professor of general chemistry, makes an interesting and satisfactory report and he should be commended for his earnest efforts on behalf of the College.

The dean of the post-graduate course and special courses, Dr. J. W. Sturmer, has given close and active attention to his duties in the College and has aided greatly in looking after and caring for the students. Your President desires to commend him for his faithful and earnest efforts.

The financial condition of your College, while not as flourishing as we would like to report, shows that your Treasurer will have approximately $10,000 to our credit on April 1, 1918. The mortgages upon your property are the same as last year.

During the past year 6 members were elected to your College and 3 died, which makes the present active membership 147. Three associate members were elected during the year, which makes your associate membership at the present time 17.

It seems scarcely necessary for your President to make any extended comments regarding the loss which the College has sustained in the death of Prof. Remington. He had been intimately associated with the College for many years as professor and dean and had served on many of the most important committees and had also taken an active part in all the movements towards the advancement of the institution. The memorial meeting held in this room on January 4, 1918, was a most notable occasion, and seldom, if ever, has it been the privilege of your President to have heard such eulogistic comments made regarding the results of a most useful life's work. He truly has left a name in the pharmaceutical and scientific world at large which places him in the list of those world-renowned pharmacists who have passed beyond—Proctor, Parrish and Maisch.

Professor Remington left a legacy to the College—not only a legacy of fame which he himself had built up, but a material legacy for which he provided in the eighth item of his will, which reads as follows:

> I give and bequeath unto The Provident Life and Trust Company of Philadelphia, and my son Joseph Percy Remington, their Heirs, Executors, Administrators, Successors and Assigns, Ten Thousand Dollars, In Trust, nevertheless, to invest, re-invest and keep the same invested, under the powers and authorities by this my Will upon my Trustees conferred, and to collect and receive the income, issues, dividends and profits thereof, and after paying out of said income all lawful costs, charges, taxes, commissions and expenses incident to the care and management of said Trust, then to pay over said net income, half-yearly, beginning with and disbursing the same from the time of my decease, unto the Treasurer for the time being of said Philadelphia College of Pharmacy, for application by said College in assistance of worthy and deserving students at said College, in payment of their tuition fees. Said College shall, in the exercise of its sole and unrestricted judgment, choose the students who may be worthy and deserving of such assistance, and said Trustees are hereby exonerated and released from any responsibility to see to the application of the income from said Trust after said Trustees shall have paid the same to the person who may be for the time being Treasurer of said Philadelphia College of Pharmacy. If said Philadelphia College of Pharmacy should cease to exist as an independent and separately conducted College for the instruction of students in the art and practice of Pharmacy, then and in such case said Trust for the use and benefit of said College shall cease and determine, and the money, investments and securities which may then comprise the capital or principal of said Trust, shall be distributed among the persons who would have been entitled to take and receive the same under the Intestate Laws of Pennsylvania if I had died possessed thereof at the time of the cessation of said Trust as aforesaid."

We have all lost an active associate and friend and it now becomes our duty to strive to live up to and maintain the standard which he had attained.

A further clause in his will provides that his apparatus, specimens and illustrative material of every kind owned by him and used in connection with his course in theory and practice of pharmacy be bequeathed to Charles H. LaWall, and it is with pleasure that your President quotes in full a letter received from Professor LaWall on the 13th of March, 1918:

PHILADELPHIA, PA.,
March 12, 1918.

MR. HOWARD B. FRENCH,
York Avenue and Callowhill St.,
Philadelphia, Pa.

My dear Mr. French: As you doubtless know Professor Remington bequeathed to me all of the apparatus, specimens and illustrative material of every kind owned by him and used in connection with his course in the Theory and Practice of Pharmacy.

I feel sure that the proper ownership of all of this material should be vested in the College and I hereby transfer the entire collection, as received by me from Professor Remington, to the Philadelphia College of Pharmacy, through you as its principal officer.

This does not include Professor Remington's scientific library which was bequeathed to Professor Cook and me jointly and which we expect to place in the Pharmacy department of the College as a separate library for that Department.

When the time comes for me to lay down my duties, however, I shall take care to provide that my share of this library, too, shall go to the Philadelphia College of Pharmacy..

Very truly yours,
(Signed) CHARLES H. LAWALL,
Dean.

Again your President desires to call attention to the approaching centenary of your institution. Year after year is passing by and yet we have no site for new buildings but he still hopes that the city of Philadelphia or the Park Commission will be able to arrange to place your College upon the Parkway. He can but regret that up to the present no tangible result has been obtained by those who have worked to secure such a site.

Your President wishes to extend his appreciation and heartfelt thanks to all those who have so zealously coöperated with him during the past year in which many trials and difficulties had to be overcome, and he asks that the same loyal support, coöperation and activity will be extended to your executive during the coming year.

SOME ADDITIONAL RESOLUTIONS ON THE DECEASE OF PROFESSOR REMINGTON, RECEIVED SINCE THE PUBLICATION OF THE MEMORIAL NUMBER OF THE JOURNAL.

HAVANA, January 17, 1918.

MR. HOWARD B. FRENCH, *President of the Philadelphia College of Pharmacy,*
Philadelphia, Pa.

Dear Sir: It becomes my duty as Rector (President) of the University of Havana to send to you a copy of the resolutions unanimously adopted by the professors of the University in the regular meeting held on Jan. 14 inst. We all understand that the loss of Professor Remington is an irreparable one for your College as well as for the pharmaceutical profession.

Allow me to express in this occasion my personal sorrow for such a misfortune.

Believe me, dear Mr. President,

Very respectfully yours,

DR. GABRIEL CASUSO.

HAVANA, January 17, 1918.

RESOLUTIONS IN MEMORY OF PROFESSOR JOSEPH P. REMINGTON ADOPTED BY THE MEMBERS OF THE UNIVERSITY OF HAVANA, CUBA.

At the regular meeting of this University held on January 14 inst., after the reading and approval of the minutes of the previous session, Professor José Guillermo Díaz announced the loss of the exceptionally useful life of Prof. Joseph P. Remington. The assembly, composed of fifty members of all the Faculties of the University, as a tribute of respect and estimation toward our departed friend,

Resolved, That the President and Professors of the University of Havana deplore with profound sorrow the death of Professor Joseph P. Remington.

Resolved, That a message of condolence be sent by the President of the University to the family of late Prof. Remington and to the College of Pharmacy of Philadelphia.

DR. CASUSO,
Rector (*President*).
DR. J. GOMEZ DE LA MARA,
Secretary.

UNIVERSITY OF GLASGOW,
9 February, 1918.

THE DEAN OF THE PHILADELPHIA COLLEGE OF PHARMACY:

Dear Sir: As chairman of the British Pharmacopœia Committee of the General Medical Council, I desire to express, for my colleagues and for myself, our deep regret for the death of Professor Joseph Price Remington, and our sympathy with the profession of pharmacy in the United States in their mourning for a great leader. Dr. Remington's relations with our Committee were ever cordial and helpful, and we remember with gratitude the valuable aid he afforded us in the preparation of the current issue of the British Pharmacopœia, 1914.

I should be obliged if you would convey our sympathetic sentiments to his bereaved family, as I am ignorant of the proper manner of addressing them. I am

Very sincerely yours,
DONALD MACALISTER,
President of the General Medical Council of the United Kingdom.

LIVERPOOL CHEMISTS' ASSOCIATION.
ROYAL INSTITUTION,
COLQUITT STREET,
LIVERPOOL,
February 27, 1918.

THE SECRETARY, PHILADELPHIA COLLEGE OF PHARMACY,
PHILADELPHIA, U. S. A.:

Dear Sir: The members of the Liverpool Chemists' Association at its meeting on February 13, 1918, unanimously agreed to a vote of condolence with your institution on the death of Professor Remington. His work on Practical Pharmacy and contributions to pharmaceutical research generally has made his name world-famous, and on those occasions when he visited England and became acquainted with several of our members, his personal charm appealed strongly to his fellow workers here.

I am directed to convey to your College the greetings of our association especially at this time when civilization is united in furthering the cause of liberty, freedom and brotherhood.

Trusting that worthy successors will be forthcoming to carry on the work of our deceased friend and comrade,

Yours faithfully,

David H. Evans,
Hon. Secretary.

Denver, Colorado, February 19, 1918.

Whereas, Death having removed one of America's foremost representatives of the pharmaceutical world, in the person of Joseph P. Remington, ex-President of the American Pharmaceutical Association, ex-Chairman of the Council of that body, Chairman of the Committee of Revision of the United States Pharmacopœia, Editor of the United States Dispensatory, Author of The Practice of Pharmacy, Dean of the Philadelphia College of Pharmacy:

Be it resolved, That the Denver Branch of the American Pharmaceutical Association hereby gives expression to the deep regret that it feels for his loss.

Resolved, That the Denver Branch extends to the bereaved family of the deceased, and to the President and Board of Trustees of the Philadelphia College of Pharmacy, the deepest sympathy in their bereavement.

Be it further resolved, That the Secretary be directed to transmit to Mrs. Elizabeth B. Remington and family, 1832 Pine St., Philadelphia, Pa., also to Mr. George M. Beringer, Chairman of the Board of Trustees, 501 Federal St., Camden, N. J., a copy of these resolutions.

Samuel T. Hensel,
Committee.

[Seal.]

A. W. Clark, *President of the Denver Branch of the American Pharmaceutical Association.*

Fred C. Shaw, *Secretary.*

CORRESPONDENCE.

Department of Agriculture,
Bureau of Chemistry,
Washington, D. C.,
April 10, 1918.

Mr. George M. Beringer, Editor, Am. Jour. of Pharmacy,
145 N. 10th St., Philadelphia, Pa.

Dear Mr. Beringer:

Permit me to call attention to an error in the March number of your journal.

In the article entitled "Quarterly Review on the Advances in Pharmacy," Mr. Thum stated as follows: "To an American Pharmacist mention of the words 'Hanbury Medal' always brings to mind the first and only American pharmacist to have received this award, our dear and distinguished friend, the late Prof. John M. Maisch," etc.

You are of course aware of the fact that Dr. Frederick B. Power, now pharmaceutical research chemist, in charge of the phytochemical laboratory of the Bureau of Chemistry, has also been the honored recipient of the Hanbury Medal, as Mr. Thum could have learned by consulting the files of the Journal. References to this fact are to be found on pages 290 and 566 of Vol. 85, 1913, and on pages 94 and 95 of Vol. 86, 1914, the congratulatory letter of Howard B. French, president of the Philadelphia College of Pharmacy, and the response of Dr. Power are reproduced. Since Dr. Power is one of the most distinguished sons of the college, and in fact a former pupil of Professor Maisch, as well as one of the most brilliant phytochemists in the world, it is highly proper that the error above referred to should be rectified in the Journal as promptly as possible. Will you kindly give this matter your personal attention?

Respectfully,

V. K. Chesnut.

THE NATIONAL PHARMACEUTICAL SERVICE ASSOCIATION.

At the regular monthly meeting of the National Pharmaceutical Service Association held April 9, 121 applications for membership were acted upon, bringing the total membership in the association well above the 1,200 mark.

Although less than one year old, this association has made great progress, and one of the very encouraging reports at the April meeting was that of the President, who stated that Congressman Edmonds had notified him that the propaganda work which had been done was bearing fruit, in that the number of Congressmen who were interested in seeing the Edmonds Bill passed was constantly increasing. Instead of being urged to vote for the measure, many of them are coming to Congressman Edmonds and offering their aid in having the bill pass the House.

Dr. E. G. Eberle reported for the delegation which had been sent by the Association to attend the Conference on the Edmonds Bill at Baltimore, March 18, and the hearing at Washington, March 19. A proposition from Mr. C. A. Mayo, of New York, to have petitions signed by members of the families of soldiers, asking that the Edmonds Bill be passed, was laid before the association, and it was decided to bring this matter before every member at an early date, so as to get the greatest value from this propaganda while the Committee on Military Affairs has the Edmonds Bill under consideration.

Mr. Ambrose Hunsberger reported that the support of the Philadelphia County Medical Society has been enlisted in this measure, and that they have appointed a committee of five physicians to coöperate in having the bill passed. The matter of sending literature on the newer antiseptic products to pharmacists now in the service was then discussed, and the committee which had been appointed for that purpose was instructed to consider it further.

Plans are being made by the executive committee to make the annual meeting of the association, which will be held some time during the second week of June, as comprehensive as possible.

The next meeting of the association will be held on Tuesday, May 14, 1918.

BOOK REVIEWS.

The Dispensatory of the United States of America—Twentieth Edition, by Joseph P. Remington, Ph.M., F.C.S., and Horatio C. Wood, Jr., M.D., and as Editorial Associates Samuel P. Sadtler, Ph.D., LL.D., Charles H. LaWall, Ph.M., Henry Kraemer, Ph.G., Ph.D., John F. Anderson, M.D. Publishers, J. B. Lippincott Company, Philadelphia and London.

The twentieth edition of this encyclopædia of materia medica covers another period of marked progress in the medical and pharmaceutical professions. Since the appearance of the previous edition in 1907, revisions of the United States Pharmacopœia and National Formulary have been published and likewise of a number of the foreign pharmacopœias; included among these may be mentioned those of Great Britain, France, Germany, Italy, Spain, Norway, Sweden and Finland. The full influence of the Food and Drugs Act of 1906 and of the Harrison Anti-Narcotic Act of 1914 upon medical practice has likewise become apparent. The great advances that have taken place in the sciences and in medical and surgical practices as well as, in the recent years, the effect of the world war upon these practices have all been agencies that have contributed toward making necessary the thoroughly revised and largely rewritten twentieth edition of this, the recognized commentary upon the standard authorities. This work of more than two thousand pages has crowded into it so much of the knowledge pertaining to materia medica, both fundamental for the practitioners and for reference, that it can not fail to retain its position as the compendium and guide alike to medicine and pharmacy.

The scope of the work, encyclopædic, and the style of treatment of the subjects has been continued as in the previous edition. The characteristic featuring of synonym, alternative quantities, diacritical marks as a guide to pronunciation, etc., have all been retained and several new ideas have been added among which we note the recognition of the "New and Non-Official Remedies" published by the American Medical Association and all such medicaments are designated by "N. N. R. 1917."

The uniform and systematic method of treating each subject adopted throughout Part I is especially commendable, as it permits one to locate quickly the information sought. The distinctive paragraphs with appropriate headings show at once where to look for the botany or chemistry, the composition, action, uses, doses, etc.

As an untitled part of the book, there appears as a sort of prefatory a number of chapters containing important information, much of which is however of the character, that in other works is placed in an "appendix." Among these may be mentioned the "Abbreviations;" "Titles of Journals and Books Referred to in the Text;" "Glossary of Medical Terms;" "Index of Diseases," of especial interest to the practicing physician; "The Food and Drugs Act" with the several Amendments and the Regulations and numerous Food Inspection Decisions, which should be of great value to the mercantile interests; the "Harrison Narcotic Act" and the Regulations framed for its enforcement; and a well-compiled "Index" of these two federal acts and the regulations thereon.

Part I has been mainly restricted to the consideration of drugs and formulas official in the United States and British Pharmacopœias and the drugs of the National Formulary have been generally relegated to Part II and the consideration of all the N. F. formulas limited to a condensed abstract in Section 2 of Part III unaccompanied by comments either pharmaceutical or medical.

This method of the division of subjects has introduced many incongruities and minimized the consideration of many drugs and preparations that from their extended use must be considered as important in American medical practice and given undue prominence to some that are of scant use and relatively unimportant. This is the one feature of the book which we feel called upon to criticize adversely.

No well-defined rule has been adhered to in deciding what was to be admitted to the U. S. Pharmacopœia and what was to be incorporated into the National Formulary. In the absence of an established principle on this question and as the Food and Drugs Act, that has been given such prominence in this Dispensatory, designates both as "official" and of equal authority, we regret to note the attitude of the authors regarding the N. F. standards and the minimized treatment accorded to these. Many of the N. F. standards from either a commercial or medical viewpoint are of far more importance than are some of the foreign pharmacopœial subjects discussed in Part II. As examples, convallaria flowers and root, cocillana, condurango, euphorbia pilulifera, cypripedium, geranium, echinacea, etc., treated as N. F. drugs in Part II, are certainly more used and of more importance in American practice than are Acaciæ Cortex, Belæ Fructus, Buteæ Semina, Ispaghula, Sappan, etc., included in Part I, because they are in the British Pharmacopœia. It is noted that these are given under their Latin official titles while the N. F. drugs as a rule are listed under their English or common names. Very few of the drugs listed in Part I are of greater commercial value than are the legal standards for Crocus, Cacao, and Vanilla, which as N. F. Drugs are listed in Part II.

The rule laid down, however, could not be invariably carried out in the case of drugs that were not recognized by the U. S. P. but were in both the British Pharmacopœia and the National Formulary. We find consequently, that such drugs as Chirata, Cusso, Euonymus and Krameria are presented under their British Pharmacopœial titles and the legal title, that of the N. F., may be only referred to in the article and in most of these cases the description and standards of the N. F. are given only secondary consideration, even if they are the law of the country.

We note also that in the class of Wines in Part I, the plan has had a "slip up" and that here after the titles for certain of the Br. Ph. wines such as those of antimony, colchicum, iron citrate, and ipecacuanha, (N. F.) has been added and not always bracketed.

All of the important parts of the United States Pharmacopœia IX have been included, almost verbatim, in this work and the N. F. only in abstract, at least so far as the formulas. Thus this book will in many ways replace the necessity for the two legal standards. The typography and "bookmaking" parts are excellent, clear, distinctly legible.

The recognized standing of the authors and editors makes the book especially valuable as a work of reference that can as a rule be relied upon. It will continue to be indispensable to every active physician, pharmacist and laboratory worker.

G. M. B.

TREATISE ON APPLIED ANALYTICAL CHEMISTRY. Methods and Standards for the Chemical Analysis of the principal Industrial and Food Products, by Professor Vittorio Villavecchia, Director of the Chemical Laboratories of the Italian Customs, with the collaboration of a number of trained investigators. Translated by Thomas H. Pope, B.Sc., A.C.G.I., F.I.C., University of Birmingham, England. Published by P. Blakiston's Son and Company, Philadelphia.

This treatise deals with the chemical analysis of industrial products, which is of great importance in the purchase of raw materials, in the control of manufacturing processes and in the determination of the value, impurities and adulterations of the finished products.

In many cases numerous methods are given in the literature, some of which are equal in accuracy to exact scientific investigations, while others require less precision and yield results relative only to the procedure employed; certain states have issued official standards and in many cases industrial concerns fix beforehand the methods to be employed for the analysis of the products.

It is the purpose of this book to give methods and standards for commercial analysis which have been either officially prescribed or repeatedly tested in the laboratories under the author's direction.

Vol. I deals with the analysis of potable waters, chemical products, fertilizers, cement materials, metals and alloys, fuels, tar and its derivatives, mineral oils and fatty substances and their industrial products. The first chapter deals with the analysis of water for potability and partial and complete analyses for industrial purposes.

The second chapter treats upon over a hundred different chemical products arranged alphabetically without regard to their organic or inorganic origin, from acetone and aniline to sulphur in its various forms and including the important acids and their salts and such compounds as chloroform, ether, bleaching powder, alum, etc.

Then follow chapters (III to X) on certain classes of substances: Fertilizers giving general methods and a special part for the examination of particular kinds. Cement; limes and cements, giving chemical and technical tests. Metals and alloys; of which a large number are treated, such as iron, special steel, aluminum, brass, bronze alloys, etc., metallic platings. Fuels; chemical analysis and calorific value. Coal tar and its products. Mineral oils and their derivatives; chemical and physical tests. Fatty substances; general methods of analysis, with special parts given to vegetable and animal oils and fats, marine animal oils and waxes. Industrial products from treatment of fatty matter; as specially treated oils (boiled, hydrogenized, etc.), soaps, glycerin, etc.

The book is well and concisely written and excellently translated and unnecessary repetition is avoided. In the examination of materials a brief description is given, the adulterants and impurities likely to be present stated and qualitative (and when important, quantitative) tests given for their detection or determination and, in most cases, methods for the evaluation of the substance itself. Over fifty tables are included, giving the characters, composition, etc., of nearly every class of products treated.

This book will recommend itself highly to those analysts especially who have a large variety of substances to examine and to those who desire a guide to tried and tested methods.

Vol. II, which is soon to be issued, will treat of food products, alcoholic beverages, essential oils, varnishes, rubber, tanning materials, colors, textiles, etc.

Joseph W. Ehman.

NEWS ITEMS AND PERSONAL NOTES.

Powers-Weightman-Rosengarten Co. Round Out a Century of Commercial Activity.—This well-known firm of chemical manufacturers have made a modest announcement, in the usual Philadelphia conservative style, that "the firm has completed one hundred years of continuous activity in the chemical industry in America."

This consolidation of two of Philadelphia's noted chemical manufacturing firms traces back its commercial history to those early pioneers in the manufacture of medicinal chemicals George D. Rosengarten, Charles Zeitler and John Farr. During the century, the further efforts of Thos. H. Powers, William Weightman and the Rosengartens have marked a continuous development of one of the city's greatest industries. The awards of medals made to both Powers & Weightman and Rosengarten & Sons at numerous exhibitions and by scientific bodies have been well-earned testimonies to the quality of their productions and the integrity of their business management.

The American Journal of Pharmacy is pleased to extend to Messrs. Powers-Weightman-Rosengarten Co. on this occasion our sincere felicitations and congratulations accompanied by hearty best wishes for continued prosperity and the success that their efforts merit.

Prof. Charles H. LaWall Elected Chairman of the Committee of Revision of the U. S. P.—The Committee of Revision of the United States Pharmacopœia have elected Prof. Charles H. LaWall as the chairman to succeed Professor Joseph P. Remington. This is another responsibility that has lately come to our Dean, but as he is full of vigor and possesses the ability required we predict that he will in this, as in other matters, make his great responsibilities great successes.

A National Duty.—In the present war crisis, the pharmacists of the country must assume their full share of the responsibility. Even though we have been selected for special taxation, this burden will not relieve us from other duties of citizenship. The immediate necessity is to aid in the Third Liberty Bond Issue.

The Pennsylvania Board of Pharmacy.—Examinations for registration as pharmacist or as qualified assistant pharmacist will be conducted in the Philadelphia College of Pharmacy and in the Pittsburgh College of Pharmacy on Friday and Saturday, June 7 and 8, 1918. For further information address L. L. Walton, Secretary, Williamsport, Pa.

The Lily Scientific Bulletin.—Acknowledgment is made of the receipt of Number 9, Series 1, of *The Lily Scientific Bulletin.* This number of this house bulletin contains papers by the scientific staff of the laboratory on the pharmacologic studies of the ipecac alkaloids.

Cash Prizes for the Best Article on the Value of the Wholesale Druggist.—The National Wholesale Druggists' Association announces a prize contest open to salesmen of wholesale drug houses for the best papers on "The Economic Value of the Wholesale Druggist and Reasons Why He is Essential." Ten cash prizes in amounts from $20 to $150 and aggregating $500 will be awarded by the committee of which G. B. Moxley, of Indianapolis, is chairman.

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EDITORIAL.

THE CONSERVATION OF ALCOHOL, SUGAR AND GLYCERIN IN MEDICINES.

Dr. Franklin Martin, member of the advisory commission and chairman of the general medical board of the Council of National Defense, issues the following statement:

> During the past several weeks there has been considerable discussion throughout medical and pharmaceutical circles relative to the conservation of alcohol, glycerin, and sugar as applied to medicinal products.
>
> Governmental and other authorities interested, realizing that careful consideration should be given the subject, recently met and debated the advisability and necessity of conservation measures from the standpoint of medical needs. In view of the importance of alcohol, sugar, and glycerin in the manufacture of pharmaceutical preparations and of the limited possibilities for the conservation of alcohol and sugar therein, it was deemed advisable to refrain at this time from recommending conservation of sugar and alcohol in so far as their use in pharmaceutical preparations is concerned.
>
> The amount of glycerin used in medicine when compared to the available supply was found to be relatively large, and a committee was appointed to investigate formulæ, manufacturing processes, etc., requiring glycerine and to submit plans for the curtailment of the quantity now used in case future developments should make it necessary to adopt conservation measures in relation to medicines.

Economy in the use of such expensive solvents as alcohol and glycerin must at all times claim the attention of pharmacists. Under the war conditions now confronting us, conservation becomes a patriotic duty as well as a national obligation. Medicines, however, and especially the standard legal formulas of the Pharmacopœia and the National Formulary, should be the very last products calling for changes and only under the most exacting conditions should legal standards be diminished.

Unfortunately much of the discussion engaged in has been purely academic and not based upon "that careful consideration" which such important subjects should command. Before any official promulgation be made of changes in legal standards or of regulations affecting the needs of the drug trade for medical supplies, a thorough survey of the *actual conditions and needs* should be made by practical men and not by theorists. The necessity of conserving the industries of the country and manitaining these at their maximum efficiency has at times appeared to be overlooked by over-enthusiastic officials or notoriety seekers.

At the hearing referred to, it was stated that more alcohol was available at the present time than would be required by the United States and our allies for some time to come and further that immense stores of corn unsuited for food consumption as such would rot unless used as a source for alcohol production. Other sources for the production of alcohol available to the American people indicate no lack of supplies or possibility of need for conservation.

Regarding sugar, it developed that the consumption of sugar for medicines was but a very small percentage (possibly not more than one fifth of one per cent.) of the total consumption. Since in the recent regulations promulgated for the conservation of sugar supplies, the production of ice cream, surely a pure luxury, was to be encouraged and allotted a full one hundred per cent. of sugar requirements, consistency will require that the same privilege be extended to druggists and manufacturers needing sugar for medicines which must be classed with the necessities.

The statement then made that upwards of twenty per cent. of the glycerin produced in the country was consumed in medicines, we are inclined to doubt. It may be true that such a percentage of the total amount produced passes through the drug and chemical trades, but it is within our knowledge that, in recent years especially, much of this has been resold and diverted to industries not at all associated with medicinal products. We are inclined to believe that an actual survey made would prove the unreliability of the statistics upon which this statement was made.

G. M. B.

THE ANNUAL PHARMACEUTICAL MEETINGS.

The season for the annual conventions of many of the state associations of pharmacists is at hand and the time for the meeting of the American Pharmaceutical Association is rapidly approaching. The programme as announced for the meeting of this national association at Congress Hotel, Chicago, August 12 to 17, is a well-balanced arrangement replete with a menu of scientific, professional, educational and trade interest problems and interspersed with sufficient entertainment features to relieve the monotony of a too heavy diet.

Despite the fact that the American Pharmaceutical Association was organized in 1852 and that many of the State Pharmaceutical Associations date back more than twenty-five years, it is disappointing to note that so large a proportion of the men engaged in pharmacy and drug trade pursuits, who are eligible for membership, are not yet associated with either local, state or national associations of pharmacists.

These various associations have important duties to perform in order to advance the professional status of pharmacy and to protect those practicing pharmacy and the various trade interests connected with the collection, manufacture and distribution of drugs and chemicals. In the discharge of these duties an association serves all and cannot discriminate between those who are members and non-members. Conversely it would appear as a universal duty for pharmacists and druggists to give loyal support as members of these organizations.

Throughout many years of membership in pharmaceutical associations the writer has never met a member who has not expressed himself as well repaid for attendance at a meeting. No matter what may be the line of work of the individual he will find sufficient of interest to him at the meeting to at least obtain his quid pro quo. This is an age of coöperative effort and the opportunities for personal profit are in direct proportion to the amount of coöperation given. The following abstract from a publication of a contemporary movement is applicable alike to the professional side of pharmacy as to the trade interests.

> Every business man who is alert to the trend of the times must realize that the day of the old-fashioned, selfish, non-coöperative merchant is rapidly

passing and that the dawn of the day for collective and coöperative competition is breaking over the business of the world.

This does not mean in any way the curtailment of individuality; quite on the contrary, it means a greater reward than ever before for the individual effort, for the stronger the character and individuality, the greater the multiplication of that power through the collective effort of the future, the wider the scope of usefulness and service to the community, and consequently the larger the personal success.

The business man who does not accept and join in this great development must eventually realize that he belongs to another age, that he is out of the running, and that his life's work may be lost.

May these timely expressions sink into the minds and influence the future actions of those who have been indifferent to their share in the responsibilities of pharmaceutical organizations.

G. M. B.

LOYALTY AND EFFICIENCY THE DEMAND OF THE HOUR.

Presumably this is a practical age. Certainly, as never before in the history of the world, is there necessity for efficiency. Nevertheless, the thoughtful citizen has not failed to note the numerous impractical ideas that have appeared from time to time in the daily press and not infrequently been advocated in professional and trade journals. Unfortunately some of these have been tried by governmental authority and he realizes that under the present state of public mind there is going to be a period of contest between theory and practice. The misapplication of zeal and energy in impractical undertakings is simply the loss of a portion of the nation's assets and the more numerous and the more pronounced these national blunders the more serious may be the results.

We have heard much of "Germany's efficiency" and we are compelled to admit that the advantage that nation has so far attained in the war is due to the application of scientific principles and the practical application of her men and resources rather than to any superiority of mentality or resources.

The idealist usually has a basis for his theories and his recommendations are as a rule the outgrowth of experience or the study of available data and so he may perform a national service by advancing progressive ideas. Not so, however, the dreamer whose fancied pictures may be without any foundation and the following of whose fancies may lead to disaster.

Pharmacy has not been devoid of its idealists with Utopian schemes nor of its dreamers whose pictures lead to the dangers of false conservation or imaginary security, men who, while lacking in the experience of practical operations of the mercantile pursuits, are very self-contained in their opinions and advice to those upon whom has devolved the duty of meeting the nation's demands in this respect. The artist skillfully paints on the same piece of canvas the mountain and the valley and the production appeals to our artistic taste of the beautiful but does not deceive us as to contour. The dreamer on the contrary presents a camouflage that may be but the covering of a calamitous pitfall.

President Wilson has very forcefully called the attention of the people of the United States to our wastefulness as a nation. The truthfulness of his statement and the necessity for national reform in this matter demands the serious consideration of all loyal citizens. The wastefulness as a nation is not only the inordinate use of materials and the national profligacy of resources but can likewise be applied to the misapplication of efforts and the wrong apportionment of service. The disorganization of industries and the use of trained specialists, such as pharmacists, in lines of work foreign to their educational fitness for service is a national loss and waste of national assets and the continuation of such errors must have a distinct effect upon our national success. The mobilization of every calling and industry into the most efficient service for the government would undoubtedly result in such a proper use of our vast national resources that the preponderance thereof would very speedily terminate the war.

No amount of loyalty and obedience to the orders of departments will overcome the evils of misapplication and the consequent loss of efficiency. The study of the best means of obtaining efficiency from our inhabitants and our national resources is a prime duty of those in authority. The practical man of business and of experience must sooner or later be given an opportunity to demonstrate the value of his knowledge and experience and the sooner the theorists and dreamers are relegated to a rear couch the better. The demand of the hour is for loyalty and efficiency harnessed in one team.

G. M. B.

MEDICINAL PLANTS—PRESENT AND FUTURE SUPPLIES.[1]

By Prof. Henry Kraemer, University of Michigan.

We have heard so much about our country's unpreparedness and the apparent inability of the government to adequately cope with the war situation, that it must be indeed a relief to learn that in the domain of medical and surgical supplies there has been a spirit of coördination between the government forces and the manufacturers of the United States, which has resulted in the highest possible efficiency and could hardly have been improved upon had it been foreshadowed that the World War situation would arise.

At the outbreak of the European war in August, 1914, and for a short time thereafter, owing to the erratic trade conditions which prevailed, the drug market was in a turmoil. There was a disposition on the part of some to overstock, while others refused to purchase at the increasing prices which were prevalent. Very soon, however, there was a reaction and a marked stabilization was effected by the large drug dealers and manufacturers who advised caution, but not to the point of restricting trade. At the time of the formal declaration of war with Germany, the news was received in the drug market with a marked absence of excitement of any kind. In other words while there was a suspicion that there ultimately would be a break with our country and the German Empire, our markets retained their conservative position to an unparalleled extent. There was no attempt made to increase prices beyond the point actually called for by the unsettled conditions. Furthermore, I have been unable to discover a single instance in which there was any disposition to speculate in the drug market, even though for a time there was a steady increase in prices, which in some instances attained from ten to twenty times the quotations current prior to the war.

In a remarkably short time the chaotic conditions were mastered. Other foreign sources of drug supplies were opened. New industries were developed and incorporated, so that as the war has progressed the high prices prevalent two years ago have decreased on the average about 35 per cent. Probably no one industry has been subjected to more uncertainty and suffered greater inconvenience than the drug trade. Due to national and international conditions, there has been a shortage and restriction in crude drugs of all kinds. Transportation on land has been restricted and upon the sea it was uncertain, and every time a steamer was sunk on the ocean dealers knew that some drugs were on the vessel and that there would be a corresponding shortage. In spite of all the vicissitudes a call was sent throughout the country to the drug trade to comply with the government's demands and as a result the medical and surgical supplies were given precedence in every instance.

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[1] Presented to the American Philosophical Society, Friday A. M., April 19.

This remarkable condition of affairs was brought about by the temperament of the average American business man to improve his opportunities. When it was seen that there was an opportunity for the expansion of business and the possibility of world trade he with his usual perspicacity seized upon it most effectively. He increased his capital and assisted in the perfecting of existing organizations, so that at the outbreak of the war in April, 1917, all interests were coördinated and all the drug forces were mobilized. As to how effective this work of organization had been is shown by the fact that our exports had increased from about $46,000,000 in 1915 to nearly $200,000,000 during the fiscal year of 1917. It should also be stated that while this initiative was being taken and notwithstanding our resources were taxed to the utmost that the manufacturers adjusted their buying and selling so that there was a fair distribution of crude materials and an opportunity afforded every industry to expand to its utmost. A finer example of the benefits of democracy has never been demonstrated in the history of the United States. While this mobilization of industrial forces was looked upon as a matter of good business, just as soon as war was declared it was apparent that it was to be utilized for the benefit of the nation. Upon the United States entering the war the Manufacturers of Medicinal and Surgical Supplies immediately offered their services for the nation's defense. Conferences were held between the Committee on Preparedness of the American Drug Manufacturers' Association and the Committee on Medical and Surgical Supplies of the Council for National Defense. The initial meetings were held on Saturday afternoon and evening and Easter Sunday morning in 1917, and plans were worked out which have since been successfully in operation. It might seem that the question of medical supplies was of minor importance, and yet no single orders for medical supplies have ever been given that have exceeded the government's requirements. The range of drugs was quite extensive and the quantities demanded were somewhat as follows:

100,000 ounces of quinine,
20,000 ounces of strychnine,
138,000,000 compound cathartic pills.

One of the big side issues involved the adequate supply of containers, something like 6,000,000 being required. There was no disposition for any one firm to attempt to monopolize the orders and the question of distribution was left to competitive bids, and those best fitted obtained the government orders.

The American Drug Manufacturers' Association organized a War Service Committee, rendering prompt assistance to the various departments of the government when they were called upon. Indeed, had this organization not been well organized for prompt service, the government more than once would have suffered from unexpected delays incident to the securing of certain drugs which were widely distributed in small quantities among retailers throughout the country. This is only in line with the spirit which has been generally manifested of heartily coöperating with the government and a genuine desire to meet any of the demands, restrictive or otherwise, deemed essential by the authorities. In other words, the drug trade manifested a desire from the start to continue its service to the public and at the same time to coöperate with the policy announced or to be announced by the President or Congress. There was no indication of any intention on the part of any one to benefit from the scarcity of certain drugs and it was fully appreciated that certain basic conditions of world merchandising should be followed.

If Germany anticipated that in the question of medicines the United States would be at all handicapped or inconvenienced, she must to-day realize her error in judgment. At only one point did Germany have any advantage and that was in the manufacture of organic chemicals which American manufacturers did not engage in for several reasons. In the first place the quantities sold were relatively small, secondly there was a great number of them and finally there seemed to be no opportunities for any "big game" or "haul." In other words, it was a big investment in a lot of little things. During the past few months, however, American manufacturers have separated the essential from the non-essential, and, acting under the provisions of the Trading with the Enemy Act, a number of American firms have procured licenses to manufacture a number of organic drugs, using enemy-controlled patents. In this list are three of the most important synthetics used by the medical profession, viz., barbital, procaine and arsphenamine, which have respectively replaced veronal, novocaine, and salvarsan.

In the second place German manufacturers were successful in securing special privileges which were beneficial to the foreign manufacturer and inimical to the development of American industries. This was in part due to the decisions of the patent office and also to the inedaquate tariff protection. We have placed a protective tariff upon our steel industry and consequently made it the wonder of the world and have established it so thoroughly that we no longer fear competition from any country. We have blindly failed to see the wonderful possibilities in the similar protection and development of the chemical industries. Without enlarging on this question there is every indication that the United States Congress has fully grasped the situation and will see to it that American industries are encouraged, and that in the future American industries will be coördinated with the life of the nation.

Coming to the subject of the Present and Future Supplies of Medicinal Plants which I have been requested to consider, the conditions in this country during the past three years have been similar to those outlined in a general way, and the outlook is exceedingly promising. The most serious drawback is the one involving the employment of labor. Then there is the uncertainty involving the specific substances required and the quantities which may be needed. This is exemplified to some extent in the gathering of digitalis leaves in the western United States. Certain of our western universities have been acting as collecting points for the gathering of wild-grown digitalis. This work has been done on the one hand in behalf of the National Council of Defense, and on the other for the use of the Red Cross. From information which has just come to my hand there is sufficient digitalis growing wild in the western part of Washington state to supply several times over the entire demand for this drug in the United States. In addition digitalis is very abundant in the western part of Oregon and British Columbia. Before the war this was allowed to go to waste and practically all that was used in the United States was imported from Europe. Since last fall there was received at the University of Washington approximately 1,200 pounds of dried digitalis leaves collected by patriotic organizations in western Washington and donated for use in army medical supplies. A large quantity has also been collected at the University of Oregon. In addition to these supplies collections have been made during the past two or three years independently in the State of Washington, and I understand that during the season of 1917, because of the scarcity of labor and high prices paid for the same, it was very difficult to secure enough digitalis to fill the orders which had been received from various manufacturers of pharmaceutical products in the United States. It is practically impossible at the present time to depend upon local collectors, so that one is under the necessity of hiring laborers and sending them into the districts in which digitalis is known to grow in abundance.

We are developing our natural resources as never before. There are fortunately very few drugs which have gone into what is called the "scarce class." These include jalap and scammony, both of which enter into the composition of compound cathartic pills. Jalap is obtained from plants growing in the Mexican Andes and for some years back the supplies have been hardly adequate. I recently examined the tubers of a closely related plant coming from Mexico which gives a far larger yield of the drastic resin, and at the present time it seems very likely that we can obtain supplies for all immediate needs. Scammony root comes to us from the Levant and there is none upon the market at the present time. Here again we are rather fortunate in being able to procure from Mexico the root of a closely related species which contains a resin having practically the same therapeutic properties as in the Levant scammony and of this Mexican scammony we have almost unlimited supplies.

A most interesting situation has developed in regard to styrax, the official article coming from the Levant and being at the present time unobtainable. A year or two ago the market price of the imported styrax was between six and seven dollars per pound. A similar product can be obtained from the sweet gum tree, *Liquidambar Styraciflua,* a tree which is common throughout the entire central and eastern United States. In fact at the present time an American styrax can be gathered and sold at a profit at $1.50 per pound. This American balsam closely resembles the Levant article, and for some purposes seems to be superior. Liquid petrolatum, commonly known as "mineral oil," formerly came from Russia, not because it was not produced in the United States in great quantities, but was imported more cheaply. To-day we are practically independent of foreign sources and are using especially the heavy California liquid petrolatum.

In addition to making the most of our natural resources, a new industry has been developed in that we are beginning to cultivate certain medicinal plants on a rather large scale. The most interesting part of this work is that it is calculated to revolutionize our knowledge of medicines. It has brought us to a realization that we have not been independent in thought and manufacture, but have been influenced to a very great extent upon European traditions and prejudices. Up until six or seven years ago no one in this country cultivated digitalis, and our pharmacopœial standards were based largely upon foreign pharmacopœias which required that leaves should be of wild plants and of second year's growth, and that they should be most carefully preserved in an atmosphere over burnt lime. American investigators showed first that cultivated plants were equally as valuable as wild plants, furthermore that the constituents of first-year leaves were the same as second-year leaves, and finally that all that was necessary was for them to be dried in the ordinary manner and kept dry.

To-day we are growing in various parts of the country a great variety of medicinal plants. Several of our large manufacturers have farms for their own use. There are a few rather large independent growers of medicinal plants and finally quite a number of our large universities in the West have experimental farms for the scientific study of medicinal plants. It is quite within the probability that within the next ten years at least 50 per cent. and it may be more, nearly 90 per cent., of all the medicinal plants which are useful will either be grown in the United States or collected from indigenous plants. This new industry could hardly have received greater stimulus than by a war cataclysm such as we are now upon. Crude drug dealers and manufacturers are alert to this situation and there are quite a number of new drug companies which are now extensively advertising "American Botanical Drugs," "Wild and Cultivated," "Collected, Cultivated, Cured, etc., under our own management." One can hardly realize the importance of this trend of events unless he was conversant with the actual conditions upon the market a few years ago. At the present time there is inspection and oversight of drugs at the point of collecting.

Up until recently there was a divided opinion in this country as to the possibility of cultivating medicinal plants and placing this industry on a paying basis. There has been a prejudice in this country against seriously considering this subject in a practical manner. No doubt some of this sentiment was started in the interest of those who were exporting drugs to this country. Fortunately, however, some ten or twenty years ago there were those who recognized that our supplies of native plants were being reduced as well as of inferior quality and attention was directed to the necessity of providing for future supplies through drug farming. Of course, sporadic attempts had been made to grow medicinal plants in this country, but, with the exception of ginseng, the attempts could hardly be termed successful. Valerian was grown in Vermont, licorice in New Jersey, saffron near Lebanon, Pa., but these efforts were of hardly more than local interest. When Mrs. Gene Stratton Porter wrote her book on " The Harvester," she struck a psychological moment and to a remarkable degree influenced business men to consider seriously this question. In the meanwhile experiments had been conducted which showed that cultivated plants were nearly if not more efficient than wild plants, and with the acceptation of this theory a few manufacturers were ready to farm a certain number of medicinal plants. Then again the U. S. Department of Agriculture had established a division wholly given to the investigation of this question. This department has done very much in an experimental way and through counsel to direct this work and assist in its development. Apart, however, from all these agencies there were a few, as A. M. Todd, of Kalamazoo, and John A. Bornemann, of Norwood, Pa., who independently and upon their own initiative have forged ahead, making a success, one in the cultivation of peppermint and the other in the cultivation of belladonna and a few other plants. The war situation, however, brought us face to face with a possible scarcity of a number of valuable crude drugs and with the experience which we have been gaining we are rapidly building up this new industry.

Large quantities of the Solanaceous drugs are used in the United States and the market supplies of these have been considerably curtailed. There is no question, however, but that sufficient quantities of the plants yielding these drugs will be raised in the United States to supply all of our future needs. One of my old students will have forty acres in *Atropa Belladonna* alone, and he has orders for the entire harvest, although not a single seedling has been put out of doors. There are others who are devoting considerable attention to this same plant. *Datura Stramonium* is likewise being grown to a very large extent. *Hyoscyamus niger* has given us considerable trouble, but the particular obstacles in growing this plant have been surmounted, so that we are likely to secure fairly good supplies of henbane.

Many of the drugs for which standards are provided by the U. S. Pharmacopœia are used in sufficiently large quantities in other industries, so that growing of the plants yielding them is attracting very wide interest. For instance licorice root, of which there are thousands of pounds imported from Russia and Spain, is to be grown on a rather large scale again in New Jersey. One thousand acres of barren land in New Jersey are to be given over to the cultivation of the licorice plant, and already some thirty acres have been planted, using the rhizomes which were imported from Mediterranean countries. This should prove to be a very good paying crop and it might be encouraged among a number of farmers, providing that some bureau of marketing be established to assemble the crops. *A priori,* one would rather expect that this would prove to be a very favorable crop in the West where *Glycyrrhiza lepidota* abounds in a wild state. Of course, some interests might be developed in the licorice fern, *Polypodium vulgare,* which is quite common in the state of Washington, and contains a principle resembling the glycyrrhizin of licorice.

The resumption of the production of camphor in the United States is of very great interest. Work has been resumed at the 2,000-acre camphor grove near Satsuma, Fla., which is operated by New York capital. For some years experiments have been conducted by the Bureau of Plant Industry of the U. S. Department of Agriculture, including the propaganda and culture of camphor and the laboratory and factory phases of camphor production. In order that the production be economically conducted, it is necessary that the operations be performed on a large planting scale. Recently the Department of Agriculture has built a "trimmer" machine for cutting down the stems and it is an excellent illustration of one of the ways in which the government endeavors to coöperate in the establishment of new industries which should have a healthy existence in this country.

There are strong indications that the farming of perfume-yielding plants will meet with an early success in this country. Thymol, an important medicine in the treatment of hookworm, is practically unavailable at the present time. Nevertheless the experiments of the government conducted at Orlando, Fla., and Madison, Wis., have shown that an acre planted with horsemint (*Monarda punctata*) will yield about forty pounds of oil. It has been calculated that the commercial production of this oil can be made to show a profit of about $16.00 per acre. The range of odoriferous plants and those yielding volatile oils which have been experimented on by the government include: Anise, basil, cajeput, calamus, camphor, caraway, cassia, chamomile, citronella, cumin, curcuma, eucalyptus, fennel, galangal, geranium, ginger, horsemint, lavender, lemongrass, marjoram, orange, palmrosa, pennyroyal, peppermint, rose, rosemary, sage, spearmint, tansy, thyme, vetiver, wormseed, wormwood and ylang ylang.

The cultivation of medicinal plants, while one of very great promise, requires a conservative handling of the situation. In this country there are a great many small growers, and quite a number of firms having small yards who are eager to experiment in this work. As a pastime it is likely to be of very great interest, but very few realize the dangers connected with it. Only recently it was reported that a whole family barely escaped death by poisoning when through an accident a can of belladonna seeds was used in the preparation of the morning coffee. If persons have fair success in growing any of these medicinal plants they quite naturally are anxious to dispose of them at a profit, and then the situation is very pathetic. Usually the farmer knows nothing as to their yield of active principles, and if a fair price is offered him he is very likely to be dissatisfied and the result is not at all calculated to maintain his interest in this work. The Department of Agriculture has determined on a conservative policy in regard to the stimulation of the drug production. They are disseminating the necessary information to those who are specially trained and supplying the needed information to them. When we reflect that there was hardly any interest in the growing of drug plants twenty years ago, yet taking it as a whole there has been considerable progress made, and it is not too much to predict that this industry will grow apace with that of other industries that have been started in the United States and while we may not be entirely independent yet we will never be as dependent upon other nations as we have been up until the present time. Not only will many of the important foreign medicinal plants be cultivated in the United States, but many of our wild indigenous drug-yielding plants will be studied and their production brought under definite control. When this time comes, it is quite likely that the price of medicines made from crude drugs will be considerably reduced and at the same time a higher and more uniform quality be secured. Adulteration and substitution will be entirely eliminated, as nearly all of the instances of sophistication in drugs is due to either carelessness or ignorance in collecting them.

Probably I should call attention to the castor-oil industry, which is being developed on a very extensive scale in Florida and Texas. The amount of castor oil consumed during normal times in this country is enormous, averaging the product expressed from over one million bushels of castor beans per year. Most of our commercial supplies have come from India, Manchuria and South America. The chief interest of the government to-day in castor oil is not its medicinal use, but its value as a lubricant for aëroplanes using a rotary motor. The demand for lubricants of this class is very great, and apparently there is no oil which is as valuable as a lubricant for fine machinery. The farmers of the Southern states are being interested and it is likely that a hundred thousand acres will be planted in castor beans. The Signal Corps of the United States government are arranging contracts with the farmers, and Dr. W. W. Stockberger, of the U. S. Department of Agriculture, is advising the farmers on such questions as the planting, growing, care and harvesting of the crop as seems best to fit each individual case. The experiments thus far conducted in the United States show that the yield per acre of castor oil seeds is between 900 and 1,350 pounds. Individuals plants alone will yield something like twenty pounds of seeds. The seeds will yield from 50 to 70 per cent. of fixed oil. This means that the yield per acre would be between 500 and 900 pounds of castor oil, or a return of nearly $300 per acre. When one considers that the care of cultivation is not more than with corn and that the plants are unusually free from fungus diseases, the success of the government crop is practically assured.

The situation then in a nutshell regarding the present and future supplies of medicinal plants in the United States is very encouraging. It has been universally acceded that in point of elegance the medicinal preparations made by American manufacturers are unexcelled. Indeed, there are quite a few American houses with branches in various parts of the civilized world. They have been supplying for some years more than one half of the medicines prescribed by physicians in the United States, and it is quite likely that one tenth of the medicinal preparations used throughout the civilized world are derived from American sources. At only one point have we been lagging behind, and this has been in the manufacture of synthetic chemical drugs, as also the productions of raw materials, such as are yielded by the cultivation of plants. The low price of foreign labor has been the chief cause operating against our developing the farming of medicinal and economic plants, as we could purchase our supplies from other countries at comparatively low figures. Now that the government has in some instances taken a vital interest in this subject, it is quite likely that some form of legislation will be passed in which there will be a subsidizing of certain industries in a manner similar to that followed by foreign governments.

Furthermore, our manufacturers have seen the importance of extending their research laboratories, and it is quite likely that scientific work will be greatly stimulated in the United States. Never before in the history of our country have we seen the close relationship between the scientifically trained expert and the manufacturer and between the inventor and the banker. The relationship is very simple and readily comprehended, as it is based on the theory of practical business. If the capitalist can be shown that any laboratory work is likely to become a commercial success, he is at once interested and his investment is certain. The story of Marshall Field and the cable is known to every schoolboy and to some it may have seemed that all the manufacturers and business men of the United States have lacked has been the supreme "nerve" which is required in the launching of new projects. This war has brought the capitalist and the industrial worker together, and no one can doubt the practical results which will be forthcoming in the future. Indeed, unless there was some such mutual understanding it would not be possible for this country to have developed almost overnight the chemical industries on such a gigantic scale. Finally, the effectiveness of our production which has been increased since this war, is due in large part to the thorough organization of our American industries, and accompanying such organization have been corresponding benefits to the nation.

SOME OLD-TIME MEDICINES.

By Dr. Fred B. Kilmer, New Brunswick, N. J.

It may be stated that some drugs and preparations are born great, at other times they attain greatness by inherent potential value, in other instances greatness is thrust upon them and such greatness may be deserved or undeserved. Finally, we have it that medicines, at one time winning popularity, apparently achieving great things for mankind, in one way or another either slowly or suddenly lose their prestige, and at last wane to the vanishing point.

It cannot be rightfully stated that a drug or a preparation which in the course of time has fallen into disuse is thereby valueless; indeed it is conceded that many medical and surgical procedures which have fallen into disuse or have been neglected were in their time of great value, and probably would be to-day were their use revived. In other words, the disuse of many of the older remedies and methods has in certain instances been ill advised.

This is not to say that medicine and pharmacy have not advanced—at times they have moved forward a thousand years in a day, but in the onrush it is possible that without due consideration things have been cast overboard. If we look back into the history of pharmacy and medicine we find whole classes of medicines at one time high in esteem only to be wholly or almost wholly discarded in a later century. As an example, such lines as elixirs, theriacums, waters, essences, mithrydates, balms, balsams, varieties of ointments and herbs, some of which have long since fallen into disuse and have become almost entirely forgotten. It is possible that with the long list of remedies we have at hand to-day there is no need to resurrect them, except that it is possibly our duty as pharmacists to be alive to the situation and in case an attempt is made to introduce under a new guise something that has heretofore been discarded, to be sufficiently familiar with the history of our calling that we may not be caught napping. Again, it is possible that in some instances the old discarded remedies contain principles which might be of value were their use revived. With this as an introduction it may not be unwise to trace a few of the preparations at one time of high popularity and in time living almost only in history.

Black Draft.—Originally devised by the court physician of Rudolph II, about the year 1600, and becoming a popular laxative.

The original formula was made up of senna, currants, coriander seed, cream of tartar and made into a decoction which afterward became official in the London and Edinburgh Pharmacopœias, as an infusion of senna.

CITRINE OINTMENT.—An ointment was known in the early centuries under this title composed of coral, quartz, white marble, white lead and tragacanth mixed with lard, suet and hen's fat. Afterwards the formula was revised by omitting some of the older ingredients and substituting sugar of lead, rose water and frankincense. In 1722 nitrate of mercury ointment (citrine ointment) became official. The first use of the yellow ointment of mercury appears to have been for the eyes, afterwards its use was extended to other maladies.

FOWLER'S SOLUTION OF ARSENIC.—Seems to have had its origin in a quack remedy containing arsenic and that subsequently an English apothecary named Thomas Fowler produced a mixture of arsenic flavored and colored with spirits of lavender. Fowler himself stated that the spirits of lavender were added to give the mixture a medicinal appearance and to avoid the use of the term "arsenic" in the title of the preparation. At the height of its popularity it attained considerable reputation for fever and ague.

FRIAR'S BALSAM.—It would appear that while this only became official in the London Pharmacopœia in 1746, for generations previous there had been sold a number of compounds under the name of Friar's Balsam, Jesuit's Drops, Turlington's Drops, etc., of a similar nature. It is supposed that it is possible this originated among some of the medical friars. The official preparation is our well-known tincture of benzoin compound.

HIERA PICRA.—Preparations under this name could possibly have been bought in Damascus one thousand years ago, and possibly in Rome and Alexandria more than a thousand years beyond that time. It is sometimes stated to be the oldest Pharmacopœial compound that remains. It is still used in some of the country districts of America and Europe. A feature of the preparation is that from its beginning it has in one way or another been a preparation of aloes, flavored, sweetened and colored.

COMPOUND TINCTURE OF LAVENDER.—At one time standing on the pinnacle of glory. Originally a compound of French brandy and twenty-seven other ingredients, including lavender, rosemary, cinnamon, nutmegs, cubebs, saccharine and roses. Somewhere in its history it acquires the title of "palsy drops." It is probable that its alcoholic and spicy nature was its only therapeutic value.

Diachylon Plaster.—This plaster is said to have been invented in the year one of the Christian era by Menecrates, who was physician to the Emperor Tiberius. There was, however, in existence a plaster made of so-called mucilages and lead before this time. Menecrates made his combination of mucilages of foenugreek, linseed, marshmallow and oil with litharge. An interesting feature is that the original formula was assembled in the form of a verse. From time to time the formula was improved. Its original name is retained to this day (its literal meaning is a preparation of juices). Now, of course, it is a lead plaster. In its earliest days an adhesive plaster was known under the names of persons who made changes in the formula. While still official this plaster is now only in limited use on account of the popularity of the india-rubber adhesive compounds. It is admitted, however, that there are certain conditions in which this plaster, notwithstanding its disadvantages, is superior for many purposes to any other form of adhesive. If a plaster with similar properties could be made with an india-rubber base it is believed this would be a considerable improvement in respect to adhesive plaster.

Dover's Powder.—The invention of a London doctor by the name of Thomas Dover, who lived in the seventeenth century, held the center of the stage for many generations. The original Dover's powder was a diaphoretic powder containing opium, saltpeter, licorice, ipecac. The originator of the preparation stated he gave as high as 100 grains of the mixture. It became official in the London Pharmacopœia in 1788, having been made famous as a sweating powder. It is still in use but only to a limited extent by the rank and file of practitioners.

Laudanum.—The original preparation under this name was quite different from the tincture of opium which bears this synonym to-day. Paracelsus, whose name stands out as one of the master pharmacists of classic times, is the reputed inventor. The original preparation contained opium, orange and lemon juice, frog sperm water, cinnamon, cloves, ambergris, saffron, to which was added pearls and the quintessence of gold. The laudanum of the early pharmacopœia was a pill mass of opium, saffron, castorium, ambergris, musk and oil of nutmeg. The great Sydenham devised the laudanum which attained great popularity on the continent. This formula corresponds more or less with the original laudanum of the pharmacopœias. There was also a similar preparation known as "black drop," which was really a vinegar of opium. There was also a vinegar of opium in the Edinburgh and Dublin pharmacopœias. To-day the name is retained as a synonym of the official tincture of opium. In the course of time the laws regulating the sale of narcotics have curtailed the sale of our familiar laudanum. There are doubtless authorities who would agree that the original preparation of laudanum had advantages over the present official preparation sold under this name.

SEIDLITZ POWDERS.—It has been suggested that this term is a misnomer. The famous Hoffman discovered the Seidlitz spring in Bohemia in 1724. The spring owed its properties to the presence of sulphate of magnesia and the sulphate of soda. It is stated this spring was at one time the principal source of epsom salts and it is well known that epsom salts was bottled and sold under this designation. In some countries to-day the term Seidlitz salts is the name for sulphate of magnesia. The original Seidlitz powder was a patented preparation claimed to possess all the properties of the medicinal Seidlitz spring in Germany. There were three powders, tartrate of soda, bicarbonate of soda, and tartaric acid; they were sold under numerical designations. The real Seidlitz powder as we know it had its origin in the substitution of a pleasing effervescent drink for a nauseous one. Seidlitz powders have in the course of their history attained widespread popularity; at times their use has waned by the introduction of mineral waters and other more popular aperients.

OPODELDOC.—This is also an item attributed to the great Paracelsus. The original preparation was opodeldoc plasters containing galbanum, ammoniac, bdellium, litharge, opodeldoc, linseed oil, waxes, and oil of laurel, to which was added numerous powders in vogue at the time to give color and odor. The plaster was a "heal all." In the course of time the name was transferred from the plaster to a liquid soap liniment which became official early in the eighteenth century. A preparation known as Steer's Opodeldoc was a preparation containing ammoniac added to the original soap liniment. Opodeldoc had at times a widespread use. To-day it holds only a subordinate position. Undoubtedly for many purposes its use is important.

PAREGORIC.—In its origin known as paregoric elixir. The original Swedish formula contained honey, licorice, camphor, oil of senna, and salt of tartar. The original formula has been greatly modified in passing through the pharmacopœias; to-day we still have paregoric with similar properties quite different from the ancient combination and with a rather waning use and popularity.

FOUR THIEVES VINEGAR.—Older pharmacists can probably remember the popular aromatic and antiseptic vinegars. The original preparation is said to have been devised to prevent the spread of the plague. The story goes that during a plague four thieves went about the French city of Toulouse plundering the dead and the dying, and the secret of their immunity was a vinegar used as a prophylactic. Preparations of this character in a limited way had descended to modern times. Their use in the sick room has at least had the merit of being refreshing and in a mild way antiseptic.

MITHRIDATUM.—Of all the famous compounds this stands out among the records of pharmacy and medicine. The inventor is said to be Mithridates the Great, King of Pontus, Asia Minor, who lived two centuries before Christ. The preparation has passed down through the centuries, sometimes containing a very large number of ingredients, at other times as few as a hundred, and sometimes less. Preparations of this character at times have acquired immense fame, Roman emperors have been recorded as compounding them with their own hands. The greatest physicians have studied this preparation with a view if possible of perfecting it.

THERIACUMS.—Are a modification of the original under other designations. At the present day we look upon these compounds as of the order of the shotgun mixtures, but in any event for long centuries they held sway as of the greatest value in medicine.

LANOLIN.—Incidentally we may regard wool grease as a substance long used by the ancients for anointing and healing, and again revived in our own day, where it has acquired a place of great value in the healing art.

One could thus go on and enumerate name after name of preparations famous in the history of medicine. The point to be urged is that it is not only interesting to know the name, origin and the preparation of these old-time medicines, but also to bear in mind that their value is not altogether historical, and we should ever keep before us that there is a possibility that in these there may be something that may be of value to the healing art.

CHLORINE AS A STERILIZING AGENT.

By Frank N. Moerk.

The term chlorination has come into use since the introduction of liquid chlorine as a sterilizing medium. This is not technically correct, for it creates the impression that sterilization is accomplished directly by the chlorine. This, however, is not the case, since the addition of chlorine to water results primarily in the formation of hypochlorous acid, according to the equation:

$$Cl_2 + H_2O = HClO + HCl.$$

The hypochlorous acid, which is unstable in the presence of organic matter, liberates nascent oxygen, as follows:

$$HClO = HCl + O.$$

Therefore it is evident that chlorination is in reality an indirect oxidation, which depends upon the preliminary formation of hypochlorous acid or its salts.

Chlorine when dissolved in water does not dissociate to any great extent, since it does not appreciably increase the conductivity of pure water. Yet we know that its oxidizing properties are dependent upon the presence of moisture. These facts are explained by the formation of hypochlorous acid, the concentration of which bears a definite relation to that of chlorine, according to the law of mass action, and therefore the hypochlorous acid is replenished as fast as consumed at the expense of the chlorine.

This agrees with the theory that chlorine acts by removing or combining with hydrogen, and thereby liberates oxygen, the ultimate reaction being

$$Cl_2 + H_2O = 2HCl + O.$$

This equation does not show the intermediate reactions which are illustrated by the previous equations.

Available Chlorine.—Available chlorine is the term used to denote that portion of the total chlorine content that takes part in the formation of hypochlorites, whereby oxygen is liberated. It will be noted from the first equation that one molecule, or two atoms of chlorine, forms one molecule of hypochlorous acid, and from the second equation that one molecule of hypochlorous acid is capable of liberating one atom of oxygen. It is this atomic oxygen that is determined analytically and calculated to chlorine, and this chlorine equivalent is what is known as available chlorine. Potential oxygen would be a far more suitable term.

Chlorinating or Oxidizing Media.—There are two chemicals now in use for sterilization of water and sewage, namely chlorinated lime or bleaching powder, and liquid chlorine. The former has for its chief ingredients, calcium oxy-chloride,[1] $CaOCl_2$, and calcium hydroxide, $Ca(OH)_2$. When chlorinated lime is added to water the oxy-chloride becomes a true hypochlorite, according to the equation:

$$2CaOCl_2 + H_2O = Ca(OCl)_2 + CaCl_2 + H_2O.$$

Thus we have an alkaline hypochlorite solution, due to the calcium hydroxide.

Liquid chlorine, on the other hand, when added to water forms hypochlorous and hydrochloric acids in dilute solutions, as follows:

$$Cl_2 + H_2O = HClO + HCl.$$

In this case an acid hypochlorite solution results.

Ionic Influence on Hypochlorites.—Since acid and alkaline solutions contain an excess of hydrogen and hydroxyl ions respectively, it may be stated that these ions exert an influence upon the action of the hypochlorites. The natural tendency of all unstable substances is to become stable, so there is a spontaneous reaction among the hypochlorite molecules which results in the formation of chlorates and chlorides, as illustrated by the equation:

$$3HClO = HClO_3 + 2HCl.$$

The chlorates are more stable than the hypochlorites in dilute solutions, and are therefore inferior oxidizing agents, while the chlorides are inert. The reaction depicted above is accelerated by hydrogen and retarded by hydroxyl ions,[2] which means that hypochlorites are more stable in alkaline solutions. The hydrogen ion also increases the reaction velocity of the hypochlorites, or in other words the velocity of oxidation is greater in acid solutions.

Processes Involved During Diffusion.—In practice, the chlorinating media are applied locally and have to diffuse throughout the entire mass of the water or sewage to be sterilized, which means that the ultimate degree of sterilization is largely dependent upon the rate of diffusion.

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[1] Ellms.

[2] LeBlanc.

Two distinct processes take place during the diffusion of the chlorinating media. The first is the spontaneous decomposition of the hypochlorite, which proceeds to a greater extent with chlorine than it does with chlorinated lime. The second is the oxidation of the organic matter, the velocity of which is greater with chlorine than with chlorinated lime.

COMPARISON OF CHLORINE WITH CHLORINATED LIME.—It has been shown above that the loss of potential oxygen is not so great with chlorinated lime as it is with chlorine and that the velocity of oxidation is lower with chlorinated lime. This latter fact is important because the oxidation of organic matter is not selective, although some substances are more readily oxidized than others. Chlorinated lime, owing to its lower reaction velocity, will diffuse to a far greater extent than chlorine, without having its potential oxygen depleted, and will come in contact with and destroy a larger number of bacteria. Therefore, given the same quantity of potential oxygen in both cases, it is evident that it will have a higher bacterial efficiency in the form of chlorinated lime.

EFFECT OF TEMPERATURE.—The influence of temperature upon the velocity of reactions is usually very great, a rise of 10° C. frequently doubling and sometimes tripling the velocity.[3] An example of this kind is afforded by gaseous hydrogen and oxygen, which do not combine at a measurable rate at 350° C., while at 600° C. the rate of combination is so rapid that an explosion results.

It seems that the velocity of reaction is nearly proportional to the square root of the absolute temperature, being accelerated by raising and retarded by lowering the temperature.

When applied to water supplies, low temperatures account for the taste, and in some instances for the odor of the hypochlorites in cold water, because the reaction is retarded to such an extent that a large portion of the hypochlorites enter the system intact, not having acted upon the bacteria or organic matters.

Applied to sewage effluents, a reduction in temperature due to dilution in streams or to cold weather would indicate that hypochlorites would be rendered ineffective because of their decreased reaction velocity and the high dilution to which they are subjected. Where sedimentation follows chlorination, the reaction would be retarded to such an extent by cold weather that a considerable portion of the hypochlorites would enter the stream intact, not having acted upon the organic matters or bacteria.

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[3] Jones.

THEORY VS. PRACTISE.—It is apparent from the theoretical discussion that chlorinated lime is more efficient than liquid or gaseous chlorine, and that this agrees with practice is proven by the comparison of results obtained at the Pennypack Creek Disposal Plant at Philadelphia,[4] where it was found that even with proportionately larger amounts of gas it was seldom that *B. Coli* were not present in the final effluent.

The substantiation of the theory that the efficiency of chlorinating media is affected by various circumstances is found in the results obtained by the Ministerium of the Interior of Italy, published under the title "Tests on the Purification of Potable Waters by Means of Chloride of Lime."[5] These results may be tabulated as follows:

1. While a certain water infected with *B. Coli* is sterilized within 5 minutes by 2 p.p.m. Cl at 40° C. (104° F.), 6 p.p.m. are required at 5° C. (41° F.).

2. The addition of a small quantity of sterile sewage or of any organic matter to the water may reduce or inhibit the sterilizing action of chlorine.

3. Turbidity counteracts the action of chlorine; the turbid water of the Tiber is not sterilized by 70 to 80 p.p.m. Cl after three to four hours; but after filtration with a bacterial content of 70,000 to 80,000 per Cc., it is sterilized by 1 to 2 p.p.m. Cl in fifteen to twenty minutes. Small particles of whatever nature serve as protectors.

4. The salts in solution favor sterilization; hard waters are more easily sterilized than soft waters.

5. Chlorine may be regarded as initiating cytolysis in germ cells through oxidative (?) changes beginning on the surface and progressing towards the interior possibly accelerated by alkalinity and OH ions.

From the public health standpoint, chlorination as a means of sterilization is far from ideal, for its action is dependent upon too many uncontrollable circumstances, such as diffusion, the characteristics of the liquid and changes in temperature.

W. R. Copeland[6] calls attention to this feature as follows:

> The good results obtained in summer time create the impression in the minds of the average person that water treated with bleach or liquid chlorine is safe to drink at all times. As a matter of fact, quite the contrary may be

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[4] *Mun. Jour.*, 3, 16, 19.

[5] *Ch. Abs.*, vol. 12. No. 4.

[6] *E.-N. Rec.*, 9, 16, 16.

the real truth, with the unfortunate result that epidemics of dysentery and typhoid fever sweep through communities that are living under a false sense of security.

Conclusions.—As the action of chlorine is dependent upon the liberation of nascent oxygen resulting from intermediate reactions, which are in turn affected by various conditions, it follows in logical sequence that the sterilization problem resolves itself into the removal of the intermediate reactions and the direct production of nascent oxygen in the water or sewage to be sterilized. This would obviate the undesirable conditions which render chlorinating media unsatisfactory.

DICHLORAMIN–T SOLVENTS.

By Elmer H. Hessler, P.D.

The germicidal properties of the halogens have been known for many years and their popular use and efficiency have been impaired only by their extreme chemical affinity and consequently their irritating nature. A comparison of their relative value shows a variance approximate to their atomic weights, beginning with fluorine as the most active, and then chlorine, bromine and iodine in succession. The European War, with its millions of casualties, necessitated the use of a very efficient and readily available antiseptic of exceptionally high germicidal power because of the unusual conditions encountered in military surgery.

Early in the war the attention of the surgeons was called to various solutions of the hypochlorites. The value of these solutions depended upon their neutrality and their available hypochlorite content ranging from 0.45 to 0.5 per cent. estimated as sodium hypochlorite. The solution which has been used most extensively is the Dakin-Carrel solution, made from chlorinated lime, monohydrated sodium carbonate and sodium bicarbonate. The solution is not stable and must be constantly assayed before use in order to insure its hypochlorite content as mentioned above. Above 0.5 per cent. of sodium hypochlorite it is irritating and below 0.45 per cent. it is valueless. This solution was used in surgery without dilution as an irrigating medium and its rapid decomposition in contact with the infected areas made its constant renewal necessary. If this was not rigidly carried out the spent solution really became a veritable incubator for bacteria.

A little later Dakin introduced[1] chlorazene, or sodium paratoluenesulphochloramine ($C_6H_4CH_3SO_2NaNCl + 3H_2O$), a compound first made by Chattaway.[2] This compound is soluble in water and was extensively used until Dichloramin-T was introduced by Dakin in Europe and by Lee, Sweet and Lewis in the United States.

Dichloramin-T, or paratoluenesulphodichloramide ($C_6H_4CH_3$-SO_2NCl_2), is a white to pale yellow powder or granule having a rather pleasant hypochlorous odor, soluble in chloroform, benzene, eucalyptol and paraffine oil, and insoluble in water. It is incompatible with alkalies and strong acids. It rapidly decomposes in the presence of the slightest moisture and of excessive heat and light. It is prepared from toluene passing through the successive compounds, paratoluenesulphonic acid, sodium paratoluenesulphonate, paratoluenesulphonchloride, paratoluenesulphonamide, and paratoluenesulphodichloramide.

When first introduced in this country[3] it was recommended to be used in solutions of chlorinated eucalyptol ranging from 2 to 20 per cent., subsequently diluted with chlorinated paraffin oil. The solutions were extremely unstable and especially so after the addition of the chlorinated paraffin oil. Chlorinated eucalyptol (Dakin) differed physically but very little from eucalyptol U. S. P., but contained varying amounts of combined chlorine ranging from 3 to 5 per cent. Using this alone as a solvent was unsatisfactory because of the lack of density, viscosity and its volatility. The addition of chlorinated paraffin oil remedied these faults, but as it destroyed the stability of the solution could not be considered the ideal means of using dichloramin-T.

The desire to arrive at a satisfactory solvent measuring up to all the requirements led to some original work by the Phipps Institute of the University of Pennsylvania and chlorinated eucalyptol 1.2 was introduced. This was prepared from eucalyptol U. S. P. by forcing chlorine into it at a temperature below 80° C. until the specific gravity of the mixture was 1.19 and on subsequent washing free from acid and drying with calcium chloride the finished product was a pale yellow oily liquid, specific gravity 1.2, with an odor a trifle more camphoraceous than eucalyptol U. S. P. This eucalyptol 1.2 was used as a single solvent in making 5 per cent. solutions for surgical work and was diluted with chlorinated paraffin oil only for naso-pharynx application where the eucalyptol would have been irritating. The constant use of these solutions made with the above solvents met with local irritation on some patients, due to the eucalyptol if not to partly decomposed solutions. Decomposition in dichloramin-T solutions is recognized by the presence of free chlorine or hydrochloric acid and a separation of crystals. Free chlorine or hydrochloric acid may be detected by holding an object moist with ammonia a short distance above the open bottle of solution.

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[1] *British Medical Journal,* August 25, 1915, and January 29, 1916.

[2] *Trans. Chem. Soc.,* 1905, lxxxvii, 153.

[3] *Jr. A. M. A.,* July 7, 1917.

The inability to obtain supplies of eucalyptol in England and the rather disappointing experience with the solutions prepared from the solvents in use was an incentive for further work on the part of Dakin and his associates and recently[4] chlorcosane was introduced, a chlorinated paraffin wax, containing from 45 to 55 per cent. of combined chlorine as a single solvent possessing in every way the properties ideal for a solvent of dichloramin-T in all its uses. It is a straw-colored oil, odorless, tasteless, slightly heavier than water and has a viscosity approximating that of castor oil.

Solutions of dichloramin-T are made by heating chlorcosane to 80° C. and then adding the dry dichloramin-T, which melts and goes into solution. To this is added a volume of chlorcosane equal to that heated to 80° C. and then the solution is filtered through paper. Solutions made in this way, observing the caution of using only perfectly dry utensils, will keep for two to three months or longer.

In using the solution the following should be observed: (*a*) Avoid direct sunlight; (*b*) if a precipitate appears which does not dissolve on warming the bottle to 80° C. the solution should be discarded; (*c*) any portion of solution poured from the bottle should never be returned to the bottle and neither should any applicators or instruments be inserted into the bottle; (*d*) remember that moisture, light and heat are arch enemies of the chemical and its solutions.

A specially constructed all-glass atomizer is the most satisfactory method of application, but it is necessary to refill the atomizer repeatedly with fresh solution and before doing so the atomizer should be cleansed with chloroform or carbon tetrachloride and dried.

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[4] *A. Jr. Pharm.*, April, 1918, reprinted from the *Chemist and Druggist.*

Dichloramin-T has indeed proved itself a valuable antiseptic and now that the ideal solvent has been found its uses should be unlimited in combating bacterial infection. Splendid clinical results have been observed with the 5 per cent. solution in surgery and skin diseases, with the 2 per cent. solution in naso-pharynx affections, and with the 0.5 per cent. solution in ophthalmology.

McNeil Laboratory,
Philadelphia.

QUARTERLY REVIEW OF THE ADVANCES IN PHARMACY.

By John K. Thum, Ph.M., Lankenau Hospital, Philadelphia, Pa.

In the Paris letter dated March 28, appearing in the *Journal of the American Medical Association,* May 4, mention is made of a demonstration by Dr. Bazin at the Society of Biology of the results of comparative experiments between the antiseptic power of the boric acid-hypochlorite mixture, also known as Vincent's mixture, and that of tincture of iodine and iodoform. His first researches were in vitro and gave evidence that to inhibit the development of bacteria in a given bouillon culture required the use of 3 grams of Vincent's mixture, while to check the cultures in the same bouillon, 10 grams of tincture of iodine and 25 grams of iodoform were found necessary. In order to determine the comparative toxicity of these chemicals, Dr. Bazin introduced them into the peritoneal cavity of guinea pigs. The introduction of the Vincent's mixture into the cavity caused only a slight reaction, while on the other hand the application of the tincture of iodine and the introduction of weak doses of the iodoform resulted in the death of the animals. In skin wounds and other superficial wounds with suppuration after infection with dirt, the tincture of iodine and the Vincent's mixture seemed to give equal results; in wounds of the muscles soiled with dirt the Vincent mixture exhibited a quite noticeable superiority. Investigation also showed that in bone wounds the mixture was much more efficacious than the tincture of iodine. On the other hand iodoform showed at all times a decided inferiority.

The Pharmacology of Iodides.—Experimental studies were performed on the absorption of iodides from the digestive tract, their passage to the blood, and consequent elimination with the urine.

Investigation showed that iodides do not appear to be absorbed by the stomach at all. The iodide content in the blood rose after each dose and soon dropped, proving that to keep a patient under the influence of the iodide many doses at frequent intervals are necessary over an entire day. Elimination with the urine reaches its height in about two hours; of course, the length of the interval depends on the promptness with which the stomach contents are passed along. Whether the iodide is taken on a full or empty stomach makes considerable difference. When the patient is on a constant diet the drug does not seem to modify the viscosity of the blood; the literature on the action of this drug in this regard contains conflicting statements based on tests without control of the diet. The influence of iodides on the heart action failed to reveal any change in the blood pressure or pulse rate even when the blood contained amounts of the drug much above the therapeutic dosage. When the iodide content of the blood was advanced to a very high figure, the heart action was depressed and the blood pressure dropped, as the blood was thus rendered hypertonic. The investigator comes to the conclusion that the therapeutic action of iodides in circulatory disturbances has no experimental basis. Any benefits from its use at all suggests a syphilitic origin for the disturbance. (*Ugeskrift for Laeger,* No. 4, p. 139, 1918, by J. Buchholtz, through *J. A. M. A.,* April 20, 1918.)

Effects of Flavine in Wound Treatment.—In view of the publicity that flavine has had in the last few years from the military base hospitals as a surgical dressing, a recent report of its use cannot be without interest. All cases were dressed with a 1–1,000 solution of acriflavine in sterilized physiological salt solution. It was used to irrigate wounds at each change of dressings and also in gauze packs inserted in the wounds and in the outer gauze dressings. The cases treated were: (1) those in which infection and sepsis were active and not under control when treatment was begun; (2) those in which infection and sepsis had been controlled and repair had already begun before flavine was employed. In cases in which infection and sepsis were active and uncontrolled the use of flavine following suitable operative measures had no beneficial effect on the subsequent progress of the case in so far as control of sepsis is concerned. Any differences noticed were unfavorable. In quite a number of cases in which sepsis had already been controlled and repair had begun flavine acted injuriously, mainly by producing an unhealthy granulating surface. While these conclusions do not prove that flavine is without powerful germicidal action in some experimental conditions, the investigator believes they show that its clinical use is not without untoward results. His observations have led him to abandon the use of flavine in his work altogether. Results were never good. (W. Pearson, *Lancet*, London, p. 370, March 9, 1918.)

Utilization of the Laboratories of Our Universities.—It appears that the much needed synthetic chemicals, especially those that have proved their value, and which the teaching and research institutions in this country must certainly have if their work is to go on, are now being manufactured and supplied by the chemical laboratory of the University of Illinois. Nearly a dozen chemicals for which we had formerly to depend on foreign manufacturers for supplies were made in amounts the value of which is estimated to be $5,000 and were distributed among more than thirty laboratories and supply houses. We hear that the work of making these chemicals has since expanded and elaborated to such an extent that there are now available nearly 120 different products. To date $9,000 worth of these have been distributed outside the laboratory in amounts ranging from a few grams up to pounds.

These products have each been thoroughly tested in comparison with a well-known standard product, and have absolutely conformed to every requirement, and in many instances they have been found to be much better than the product that originally came from abroad. It is said that the synthesized chemicals turned out by this laboratory numbered among them dimethyl glyoxime, nitroso beta naphthol, cupferron, nitron and ninhydrin, all of some use in laboratory research work, and many others. It would be interesting to know what the " many others " might be.

Skilled Adulteration.—The Food and Drug Department of Kentucky reports that the analysis of foods and drugs is becoming increasingly difficult all the time because of the skillful forms of adulteration practiced by the manufacturers of such commodities. It appears that they employ experts who have learned to sophisticate in the most scientific manner; indeed, the adulteration is often so cleverly accomplished that it is extremely difficult for the analyst to detect the fraud with any degree of certainty. It is often necessary to perform many analyses of products of assured purity so as to determine the maximum limit of allowable variation of certain constituents. An increase of a very small per cent. in excess of water in a canned fruit or vegetable means more profit and its detection is often difficult if not impossible.

TEST FOR ARSENIC IN SODIUM SULPHATE.—The author claims that when this salt is dissolved in distilled water and a turbid solution results, it indicates the presence of arsenic. This can be proven by adding 5 grams of sulphuric acid and the same quantity of metallic zinc to 100 mils of distilled water. The container is then capped with a white filter-paper cap. This paper should be about four to five inches in diameter and moistened with a 1 per cent. solution of mercuric chloride and dried before used. The ends of the paper are turned downward over the neck of the bottle and held firmly in place in a manner most convenient to the operator. If, at the end of forty or fifty minutes, the paper still remains white, the reagents are considered pure. About 25 grams of the sodium sulphate are put in the bottle and is shaken until the salt is dissolved. If arsenic is present the paper will turn yellow and then brown, the intensity of the color, of course, being proportional to the amount of arsenic present. This production of color is caused by the hydrogen arsenide formed by contact with the nascent hydrogen. The investigator states that this test will be found of service in detecting very small amounts of arsenic in various drugs. As small a quantity as one hundredth of a milligram per cent. can be demonstrated. This test was particularly useful in detecting arsenic in cream of tartar. (*J. de Médecine de Bordeaux,* by P. Carlos, vol. 14, p. 88, through *Jour. A. M. A.,* February 23, 1918.)

CHEMICAL TESTS OF DRINKING WATER.—The writer of this article is of the opinion that the determination of the chloride in a drinking water is a safe test of its purity. He found that when this test was negative, the bacteriologic tests were always negative, too, and vice versa. When the chemical test showed that the water was good, the bacteriologic findings never showed that it was palpably bad. He always found the sodium chloride content between 8 and 17 mg. in the pure waters, while 15, 20 or 35 mg. showed manifest pollution. The author of this paper also claims that it is very important to know the average chloride content of the pure waters in the region. This can be determined in a few hours by analysis of a certain number of the sources of the water. Such a procedure establishes the normal chloride content of the basin, so that any variation from this attracts attention at once. In one valley into which the troops came he rapidly determined that the standard for the pure water in the valley was 15 mg. sodium chloride; 0.5 mg. oxygen consumed by organic matters; the hydrotimetric degree, 31. On examination of eleven springs in this valley, nine showed this standard; one showed 20 mg. sodium chloride, undoubtedly a suggestion of contamination, and one showed 12 mg. with hydrotimetric degree of 27, this plainly suggesting flushing with insufficiently filtered rain water. Naturally these springs were not allowed to be used, and the bacteriologic findings showed at least 1,000 colon bacilli in each of these two springs, while in the others they ranged from zero to 20, and only in three reached the number of 100. (*Bulletin de l'Académie de Médecine,* Paris, March 5, 1918, 79, No. 9, by L. C. Maillard, through *Jour. A. M. A.,* April 27, 1918.)

ALKALOIDS OF IPECACUANHA.—*Iso*emetine, which has heretofore been produced or isolated in the form of the benzoyl derivative, can now be produced by the reduction of methylpsychotrine; emetine is produced at the same time in conjunction with the stereoisomeride, as *iso*emetine is also known. The base and several salts have also been formed. *Iso*emetine can also be made by the methylation of *iso*cephaëline; on oxidation it yields methylpsychotrine and rubremetine. Attempts to isomerize it to emetine have so far failed. On complete methylation and degradation by Hoffmann's method it yields a methine which is isomeric with methylemetinemethine. Dr. H. H. Dale has found that *iso*emetine has about half the toxicity of emetine when given to rabbits intravenously, whereas on cats it is practically without any emetic effect whatever. In man it seems to be very well tolerated, but it does not appear to have any curative action in amœbic dysentery. (*Chemist and Druggist,* March 16, 1918, p. 44.)

FATS AND OILS IN B. P. PREPARATIONS.—Owing to the scarcity of fats and oils the General Medical Council has authorized certain alterations and amendments to the British Pharmacopœia, 1914, for conserving these world-wide important commodities. The changes were made in response to representations from the Food Controller and the Home Office Committee on Drug Supply. As a result the following preparations were withdrawn from the Pharmacopœia until further notice: Linimentum camphoræ, linimentum chloroformi, linimentum hydrargyri, linimentum terebinthinæ aceticum, and liquor cresol saponatus. It was decreed that in the United Kingdom certain specified substances may be substituted for prepared lard and prepared suet for the preparation of official preparations; arachis (peanut) oil or sesame oil may be substituted for olive oil in official liniments, ointments, plasters, and soaps; and the use of the modified castor oil of commerce commonly known as "neutralized seconds castor oil" is now permitted in the manufacture of those official preparations for which hitherto castor oil was directed to be used.

THE NEW REMEDIES OF 1917.[1]

By Thos. Stephenson, Ph.C., F.R.S.Edin., Editor of "The Prescriber."

(Continued from page 369)

Emetine.—The problem in connection with the use of emetine has been its administration by the mouth in the case of dysentery carriers. Hypodermic injections of the hydrochloride do not reach the encysted form which inhabits the intestinal tract of carriers, and it is necessary to give *per os* some form of the alkaloid which is insoluble in the stomach, but soluble in the intestine. *Emetine Bismuth Iodide* is theoretically insoluble in the stomach, but it is by no means ideal, as it not infrequently gives rise to nausea and vomiting. When it is tolerated it seems to act most efficiently. The problem is how to secure tolerance, and various methods of exhibition have been tried. Keratin-coated tablets seem to offer no advantage; the best form of administration, so far, has proved to be salol-coated pills. The dose of "E.B.I." is 3 Gr., given each night, and a course consists of twelve doses.

Emetine Phosphotungstate has been suggested, but it is only a suggestion. Such a salt would decompose in the intestine into emetine and phosphotungstic acid, and the action of the latter may be deleterious.

The other alkaloid of ipecacuanha, *Cephaëline,* has been tried in cases of amœbic dysentery. While its action on the entamœba is equal to that of emetine, dose for dose, its action on the encysted organism appears to be more promising. Used subcutaneously, cephaëline causes more irritation and pain, but there is less tendency to diarrhœa during treatment. The dose is the same as that of emetine, and the suggestion is that a combination of the two alkaloids would be more efficient than emetine alone.

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[1] Reprinted from the *Pharmaceutical Journal and Pharmacist.*

HALAZONE, A NEW WATER STERILIZER.—The problem of sterilizing water for troops on the march has exercised the minds of those in authority. The hypochlorite method is useful only when troops are stationary. Chloramine-T requires a high concentration to effect the necessary sterilization, especially with hard alkaline waters, and this renders the water unpalatable. In presence of an acid, such as acetic or citric, a lower concentration is effective, but chloramine-T decomposes when kept in contact with an acid. An effective, stable, and inexpensive agent has been found in p-sulphondichlor-aminobenzoic acid, $Cl_2N.O_2S.C_6H_4.COOH$, one part of which in 300,000 will sterilize highly contaminated water. Tablets containing 4 Mg. of this substance, with sodium carbonate and sodium chloride, are used, and to these the name of *Halazone* has been given. Halazone tablets have been found to be sufficiently stable for all practical purposes. One tablet is usually sufficient to sterilize a liter of water.

COLLOIDAL SULPHUR.—The use of colloidal sulphur in rheumatism is on the increase, and as the preparation can easily be made by any pharmacist, a few lines may be devoted to this subject. The colloidal sulphur used with success by Major Comrie in cases of trench rheumatism is prepared as follows: Hydrochloric acid (10 per cent. HCl), 22 Cc.; sodium sulphide (Na_2S, $9H_2O$), 5 Gm.; sodium sulphite (Na_2SO_3, $7H_2O$), 2.6 Gm.; white of two eggs; sterilized water to one liter. Dissolve the sodium salts separately, each in 250 Cc. of the water, mix, add the white of egg, and mix thoroughly. Then add the hydrochloric acid, diluted with 250 Cc. of the water. Mix, warm slightly, and make up to one liter with sterile water. The solution is dialyzed, and is then ready for use. The strength is 1 : 1,000, and the commencing dose is 1 Cc., increased to 2 Cc., injected into the painful area of muscle, the point of injection being slightly varied each time. An injection is given every second day for three weeks, the alternate days being devoted to massage and hot alkaline baths.

SACCHARIN IN DIET.—An important communication by Mollière in *La Médecine pratique* (July) deals with the use of saccharin. He does not favor its too free use in the replacement of sugar, and holds that its sale should be restricted. Its use might be permitted in liqueurs, syrups, and the like; on condition that the amount does not exceed one centigram to the tablespoonful, and that the exact amount is definitely stated on the label. It should not be used in cakes, and especially in those containing eggs. Saccharinated cakes and pastry are very indigestible.

With regard to its use medicinally, Mollière says that he has prescribed saccharin for over ten years, and has never yet found it to cause digestive trouble or toxic effects. He has, however, never prescribed more than 0.25 Gm. *per diem.* The success obtained by its use in the gastro-enteritis of infants has encouraged him to test its value in various forms of dyspepsia and of enteritis. He concludes that saccharin is a most useful aid in the treatment of gastro-intestinal infections. He does not believe that it is in any way injurious to the kidneys. Neither in dyspepsia nor in diabetes does it appear to have any bad effect, but Mollière has taken the precaution not to prescribe it in cases of albuminuria.

Disodo-Luargol.—The new arsenobenzol-silver-antimony compound *Luargol,* which has given good results as a substitute for salvarsan in syphilis and in malaria, was described in *The Chemist's Annual,* 1917, p. 48. The drug is given by intravenous injection, the dose being dissolved in an excess of caustic soda. A new soluble form of luargol has been introduced under the name of *Disodo-Luargol;* this is a definite sodium compound, freely soluble in water, giving a brown solution. The contents of an ampoule may be dissolved in sterile water and injected immediately without the necessity of filtration. Injection is made in the same way as in the case of salvarsan. The dose to commence is 0.05 Gm., this being gradually increased until, at the sixth injection, 0.3 Gm. is reached. Two injections per week are well tolerated.

Thorium Sodio-Citrate.—The double citrate of thorium and sodium, being opaque to the X-rays while soluble in water, is used in solution for pyelography. The solution is prepared as follows: Thorium nitrate, 10 Gm., is dissolved in distilled water and heated on the water-bath; 30 Cc. of sodium citrate solution (1:2) is then added slowly with constant agitation. The precipitate formed at first is redissolved in the excess of the alkali citrate solution. The liquid is then exactly neutralized with normal NaOH solution, and the volume made up to 100 Cc. with water. After filtration and sterilization by boiling, the liquid is ready for use. A stronger solution is made in the same way, using the following quantities: Thorium nitrate, 1 Gm.; sodium citrate, 22.5 Gm.; water to make 100 Cc.

SODIUM DESOXYCHOLATE.—Wells (*British Medical Journal,* July 7) points out that bile salts have a solvent action on pneumococci, and suggests the use of sodium desoxycholate in the treatment of septic throats. The formula he recommends is: sodium desoxycholate, 2 per cent.; quinine hydrochloride, 0.25 per cent.; acriflavine, 1:2,000. This is used as a spray for the throat.

HYDROCHLORIC ACID IN NEURITIS.—It has been found by Sainsbury (*Lancet,* June 16) that strong hydrochloric acid (B.P.), applied to the skin along the line of the inflamed and painful nerve, has a remarkable effect in neuritis. The acid is applied by means of a wad of cotton wool (the fingers holding it being covered with vaseline) in a line 1½ inches wide, and left to dry, no dressing being required. Rapid relief is afforded, and the application may be repeated twice a week.

MISCELLANEOUS REMEDIES.—Among the minor new remedies that have appeared during 1917, the following may be briefly referred to:

Alcresta Ipecac is an absorption compound of the alkaloids of ipecacuanha with fuller's earth. It has been tried as a substitute for emetine, but without much success.

Arsenphenolamine Hydrochloride is the name adopted officially by the American Medical Association for salvarsan.

Apothesine is a local anæsthetic, described as cinnamyl diethylamino-propinol hydrochloride. It is used as a 0.5 per cent. solution in 0.4 per cent. sodium chloride solution with adrenalin, and is said to be non-toxic.

Anusan is a name given to certain proprietary remedies for the treatment of hæmorrhoids and rectal affections generally.

Cargentos is a colloidal silver oxide, recommended as a non-irritating antiseptic.

Citresia is magnesium acid citrate, a white powder having an acid taste. It is used as a laxative.

Diemenal is a French solution of colloidal manganese used in the treatment of malaria.

Glycarsenobenzol is a preparation for intramuscular injection in syphilis; it contains in each Cc.: novarsenolbenzol, 0.2 Gm.; guaiacol, 0.1 Gm.; stovaine, 0.1 Gm.

Iosorbol is a powder containing 10 per cent. of pure iodine in a basis of *Assorbol,* an absorbent vegetable powder.

Kephalin is the hæmostatic phosphatide obtained from spinal cord and brain tissue. A suspension containing 0.1 to 0.2 per cent. in normal saline solution is applied to bleeding or oozing surfaces.

Kinectine is a compound of quinine with hectine—quinine benzo-sulpho-para-amino-phenylarsonate. It is recommended in feverish conditions.

Methyl-phenol Serum is a serum impregnated with methylene blue and phenol. It is used as an intravenous injection in gonorrhœa.

Neoquinine is the name given to a French preparation, said to be quinine glycerophosphate.

Saurol is a sulphur-containing oil distilled from a shale found in Switzerland. It is advanced as a substitute for ichthyol.

Siomine is hexamine tetra-iodide $(CH_2)_6N_4I_4$. It contains 78.5 per cent. of iodine, and is put forward as a substitute for organic iodides, no therapeutic claim being made for the hexamine content. The dose is the same as that of potassium iodide. It is an American product.

Sofos is a mixture of sodium dihydrogen phosphate and sodium bicarbonate, rendered stable by coating the particles of one of the constituents with disodium hydrogen phosphate. When treated with water sofos forms nascent sodium phosphate, and liberates CO_2 with effervescence. Dose, 60 to 240 grains.

Stannoxyl is a preparation containing pure tin and tin oxide, recommended as a remedy for boils. The dose is 0.5 to 1.0 Gm. In some parts of France powdered tin is a popular remedy for boils, and this preparation is said to have a powerfully destructive action in staphylococcus infections.

ANTISEPTICS.[1]

A Short Account of the Work Done for the Medical Research Committee in the Pathological Department, Edinburgh University.

By Theodore Rettie, D.Sc.

In January, 1915, the National Insurance Medical Research Committee, at the request of the War Office, issued an appeal to the various medical schools to institute research on several problems which had been encountered in the medical service at the Front. One of the most urgent requirements was a reliable antiseptic for the treatment of heavily infected wounds, with special attention to spore-bearing organisms. Professors Lorrain Smith and Ritchie at once organized several sets of workers to investigate the various problems, under their own direction. The work on antiseptics was carried out by the Professors, Dr. A. Murray Drennan, now professor of clinical pathology in Otago, Dr. W. Campbell, now a captain in the R. A. M. C., stationed at Alexandria, and myself.[2]

It may seem strange that over forty years after the introduction of antiseptic surgery by Sir Joseph Lister no ideal antiseptic has been devised for such emergency treatment; the explanation, I think, is to be found in the tendency of modern surgery to leave as much to the recuperative power of the patient's own body as possible. In preparing for operation the surroundings of the patient are rendered as sterile as possible. Instruments, swabs, dressings, everything that will come in contact with him, are sterilized by heat, in fact nothing that is not sterile is allowed to touch him. Under such conditions the only antiseptic necessary is some iodine solution to sterilize the patient's skin, and lysol or such preparation in which to place instruments after use.

In accident cases where the wound is already infected, the injured tissues are carefully dissected out under chloroform and the wound cleansed with some strong antiseptic, and most often with 5 per cent. aqueous carbolic acid, Lister's original antiseptic, or, by some of the ultra-aseptic surgeons, with large douches of sterile saline (0.85 per cent. salt solution—this is known as normal saline as its osmotic pressure is equal to the pressure of the plasma of the body). Such procedure, though successful with a limited number of patients, obviously cannot be applied in a casualty dressing station; the wounds are always contaminated: they are deep, often ramifying, and may contain pieces of clothing or splinters, all presumably carrying infection. To meet such conditions powerful remedies are necessary, but they must be discriminatingly powerful; microbes which are vegetable cells must be killed, both vegetative forms and spores, which are much more resistant. At the same time the animal cells of the tissues must be damaged as little as possible by the antiseptic; free drainage for all discharges from the wound must also be maintained.

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[1] From *The Journal of the Society of Chemical Industry*, January 31.

[2] Lorrain Smith, Drennan, Rettie, and Campbell, *B. M. J.*, 1915, 2, 129.

In opposition to the antiseptic method there is what has been called the physiological method of wound treatment, introduced by Sir Almroth Wright. The wound is treated with a hypertonic saline solution, *i. e.,* a solution having an osmotic pressure higher than that of the plasma. As a result of this, fluid is rapidly poured out by the tissues, the idea being that the microbes are thus washed out of the wound and at the same time destroyed by the bactericidal properties of the lymph.

In support of this method the argument was advanced that any antiseptic damages the tissue to which it is applied to such an extent that the value of it as a destroyer of bacteria is lost, and the dead cells and coagulated albumin which the antiseptic leaves in the wound are a fertile source of further trouble. By hypertonic saline treatment this difficulty is avoided. With these two principles in mind, our object was to find an antiseptic agent thoroughly efficient as a killer of bacteria and spores, and at the same time harmless from the point of view of the wound tissues.

Our first step was to test the comparative efficiency of all the antiseptics in general use. It is obvious that it is impossible to make a definite statement as to the value of an antiseptic for wound treatment from its behavior under laboratory conditions. Most elaborate experimental methods have been devised in the endeavour to fix a standard by which antiseptics may be tested, but further research has shown that so many factors enter into the efficiency problem that test-tube methods have come to be regarded more or less as a compromise. For instance Chick and Martin[3] have shown that what might be called mass action, *i. e.,* the actual number of bacteria exposed to the action of the antiseptic in the test tube, has a very important bearing on the efficiency. The presence of organic matter other than the bacteria with blood serum, whole blood, pus, muscle extract, etc., have been employed to reproduce as far as possible conditions likely to be met with in a wound. For our tests we decided to use pieces of heavily infected tissues which were exposed for definite periods to a large volume of the antiseptic solution. The tissue after treatment was washed free of the antiseptic with successive quantities of sterile water, and in cases where it was deemed necessary, any residual antiseptic was neutralized by appropriate chemical methods. The tissue was then put into a tube of sterile broth and incubated; readings were taken at 24, 48, and 72 hours.

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[3] Chick and Martin, *Journal of Hygiene,* 1908, 8, 654.

The antiseptics tested were those in use at the military hospitals in Edinburgh and others which have been more or less in general use: they were phenol, acrosyl, kymol, chinosol (oxyquinoline potassium sulphonate), hydrogen peroxide, mercuric iodide, tincture of iodine, potassium permanganate 4 per cent., methylated spirit, turpentine, salicylic acid, sodium salicylate, methyl salicylate (oil of wintergreen), glycerin, bleaching powder, bleaching powder and hydrogen peroxide (for nascent oxygen), eau de Javelle, boric acid. Our test proved very drastic: of the above only bleaching powder, 10 per cent. solution, eau de Javelle (10 per cent. sodium hypochlorite), 5 per cent. phenol, and the mixture of bleaching powder and hydrogen peroxide had any effect in delaying or inhibiting growth, and the first two were decidedly ahead of the others. The hypochlorites were thus proved, as has often happened before, to be the strongest antiseptics in general use. There are other points decidedly in their favor. Bleaching powder is cheap, easily procured anywhere, and above all it cannot be classed as a dangerous poison. On the other hand pure liquor calcis chlorinatæ and eau de Javelle are very drastic remedies and on account of their strong alkalinity and high chlorine content (about 3 per cent. available chlorine) the tissues will not stand their continued application: for this reason they have never come into general use, though they have both been used with great success on occasion. For instance in 1846 Semelweiss, an Austrian physician, stamped out an epidemic of sepsis in his hospital in Vienna by using bleaching powder. Pasteur used liquor calcis chlorinatæ, and I am informed by Sir James Russell that when he was a medical student in this university Professor

Spence constantly used it. Our problem thus reduced itself to getting bleaching powder into a solution or powder that could be applied to open wounds without damaging the tissues unduly.

Following our original method, *i. e.,* with infected tissues, and using mixtures of varying proportions of boric acid and bleaching powder with small quantities of water, we found that with equal quantities of each we got a most pungent smelling paste which had no difficulty in sterilizing the tissue and on the other hand, apart from bleaching, did not seem to damage it as much as was expected. We also found that the gas (hypochlorous acid) given off by this mixture was capable of sterilizing highly infected tissue, provided it was allowed to act long enough; in some of the experiments two hours was sufficient. This mixture therefore gave promise of high value as a wound dressing, and I shall have occasion to refer to it later. Solutions prepared from this mixture were next tested and very interesting results were brought out; the bactericidal efficiency of the solution was greatly increased; instead of 3.5 per cent. available chlorine, as in liquor calcis chlorinatæ, one tenth of that amount gave very satisfactory results, the free hypochlorous acid proving a much better germicide than the calcium salt.

Further test experiments were carried out with anthrax spores, one of the most virulent and resistant of pathogenic organisms; we were gratified to find that our solution in a strength of 0.35 per cent. available chlorine killed the spores in one minute.

Turning next to the action on living tissues, working first on rabbits, then on ourselves, then on the patients in local hospitals, we were soon convinced that hypochlorous acid in a solution such as ours could be applied to tissues in a strength hitherto unsuspected. Large quantities of the solution can be applied to extensive wound surfaces, and may be freely introduced into the peritoneum or pleural cavity without producing any toxic effect; indeed the mixed powders may be introduced into wounds and even into the peritoneal cavity without damaging the tissues; such treatment has been found very effective in grossly infected wounds.

Pure hypochlorous acid in aqueous solution always contains free hydrochloric and chloric acids due to spontaneous decomposition, one molecule of hypochlorous acid being oxidized to chloric acid at the expense of other two molecules which are reduced to hydrochloric acid. Both are very strong acids and therefore pure hypochlorous acid is not suitable for wound treatment.

By adding boric acid to chlorinated lime in the proportions above stated we have produced a solution containing calcium biborate, an acid salt of extremely low hydrogen ion concentration; on mixing such a solution with one containing hydrochloric acid the acidity is reduced as the free H ions are taken up by the solution, therefore cannot rise above the dissociation constant for boric acid, which is very low.

By this adjustment various advantages have been secured: the alkalinity of the chloride of lime has been reduced, the full effect of the free hypochlorous acid has been secured, and the solution cannot become unduly acid. In virtue of this balance it follows that the solution can be applied freely to the tissues of the body, and that a considerable quantity can be injected into the circulating blood without harmful effect.

The high germicidal value of pure hypochlorous acid solutions was demonstrated in 1903 by Andrews and Orton.[4] In test-tube experiments they found that very weak solutions of hypochlorous acid, 1 part in 100,000, would kill pathogenic organisms in one minute but when applied to solutions containing organic matter as well as bacteria they found the hypochlorous acid so rapidly destroyed that they did not evolve any method of applying the solution as a practical antiseptic.

Putting all the above observations together we fixed on the following as safe antiseptics:

The powder, equal weights of chloride of lime and boric acid. The solution, prepared by shaking up 25 Gm. of the above mixture in one liter of water and filtering off the sediment; this solution contains about 0.26 per cent. hypochlorous acid. The powder we named Eupad and the solution Eusol—words derived from the initial letters of Edinburgh University Pathology Department.

A simple and convenient method of preparing small quantities of eusol is to make it up from liquor calcis chlorinatæ, that is 10 per cent. chloride of lime; this solution, contrary to the statement in the Pharmacopœia, keeps very well if stored in a cool dark cupboard. I have kept it for months in the laboratory with a very small loss of chlorine. This solution may be made in quantity, say two liters, filtered clear, and the chlorine content determined; the amount necessary for one liter of eusol is easily calculated; with a good chloride of lime this should be about 125 Cc., which is diluted to one liter, and shaken with 10 Gm. of boric acid; the solution remains clear.

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[4] F. W. Andrews and K. J. P. Orton, *Cent. f. Bakt.*, 1903–4, 35, Abt. 1, pp. 645 and 811.

For testing we recommend $N/10$ sodium arsenite solution; this solution keeps better than sodium thiosulphate; it is also better for testing bleaching powder, as chlorates do not interfere with the result, as they do in the hydrochloric acid and potassium iodide method.

Another hypochlorite solution has also been introduced as an antiseptic. It is known as Dakin's[5] solution and contains sodium hypochlorite and sodium bicarbonate; its action is much the same as that of eusol but it is decidedly alkaline.

As eusol is a most powerful oxidizing agent it is evident that its value as an antiseptic will soon be reduced in contact with organic fluids such as are encountered in any open wound; therefore in order to bring any effective solution into contact with the organisms hidden in the depths of the wound, large quantities must be used and the solution got down to the lowest recesses and pockets. To accomplish this, surgeons have various appliances with rubber tubes branching from a common source of supply; this method was applied most successfully with eusol by Captain Miles[6] in Edinburgh and also by Captain John Fraser[7] in France. A similar method has been advocated by Carrel, who worked with Dakin's solution at Compiegne, and constitutes the Carrel-Dakin[8] method of wound treatment.

We have further observed in open wounds a distinct outpouring of lymph on the application of eusol, thus combining the advantages of the hypertonic saline treatment with the killing power of the hypochlorous acid; here also the nontoxicity of the solution tells strongly in its favor; there are no toxic by-products at all. Carbolic acid is an excellent antiseptic, but if applied to a wound in unlimited quantity it very soon produces necrosis and may even produce symptoms of general poisoning. The cresols and emulsions containing them precipitate a sticky film of resinous matter in the wound, clogging it and preventing free drainage.

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[5] Dakin, *B. M. J.*, 1915, 2, 318.

[6] Miles, *Edin. Med. J.*, Feb., 1916.

[7] Fraser, *B. M. J.*, Oct. 9th, 1915, *Ed. Med. Journal*, Mar., 1916.

[8] Sherman, Hypochlorite Solutions for Wound Treatment, *B. M. J.*, 1916, 2, 621.

In the course of our preliminary experiments on the effect of eusol on live tissues we found that large quantities, as much as 40 to 50 Cc., could be injected into the blood stream of rabbits without injuring the animal; following up this line of investigation, with a view to attacking sepsis in the blood, we have met with a considerable measure of success. We applied this method of treatment in the first instance to a case of puerperal septicæmia in the Maternity Hospital in this city.[9] The patient was suffering from an extremely grave form of blood poisoning; the treatment was completely successful.

Following on this, Captain John Fraser, R. A. M. C.,[10] applied the same treatment to soldiers suffering from the acute toxæmia arising from wounds infected with the gas-producing organisms—*Bacillus Welchii, B. sporogenes,* etc. These organisms, which cause what is known as gas gangrene, owing to the fact that they produce large quantities of gas inside the tissues, are the scourge of the casualty clearing stations; they are spore-bearers and therefore difficult to kill and the spores are present everywhere.

In certain types of gas gangrene toxæmia, Captain Fraser found intravenous eusol as strikingly successful as in our first case, but in others it did not seem to have any effect; and this has been the experience of all workers who have employed the method. Sir Herbert Waterhouse,[11] in his report from Anglo-Russian Hospitals, says:

> We entertain the highest opinion of its value as a life-saving method in many apparently hopeless cases of septicæmia and pyæmia.

This treatment was the subject of much investigation under our own care at the Sick Children's Hospital in Edinburgh. A paper on the subject was published in the *Edinburgh Medical Journal*[12] this summer. As a result, we found that evidence of benefit was recorded in cases of lung infection such as broncho-pneumonia, empyæma, abscess of lung; in toxæmia from appendicitis, and in one case of toxic diarrhœa, also in cases of chronic meningitis. No benefit accrued in cases of rheumatism or in tuberculosis.

The problem we are now engaged on is to find out why in certain bacterial infections we can help the recuperative powers of the body and in others we cannot. We may be acting on a toxin produced by the bacteria and circulating in the blood, or we may destroy some toxic agent formed by the blood itself, or may merely stimulate a protective reaction in the body fluids. Many theories have been advanced as to the conditions found in acute toxæmia. A toxin of protein origin has been held accountable. Again, an increase in the acidity of the blood, due to the production of butyric and kindred acids by the bacteria. A later suggestion by Wright is that the antitryptic power of the blood is reduced; this allows the trypsin to prepare a suitable medium for the growth of the bacteria in the blood itself and the patient is overwhelmed by an acute invasion of the actual organisms. The subject is much too large to enter into in a paper like this. I merely indicate it to show the sort of problems that the chemist is asked to solve in pathological or physiological chemistry.

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[9] Lorrain Smith, Ritchie and Rettie, *B. M. J.,* 1915, 2, p. 716.

[10] Fraser and Bates, *B. M. J.,* 1916, 1, 83.

[11] Sir H. Waterhouse and others, *B. M. J.,* 1917, 2, 441.

[12] Lorrain Smith, Ritchie and Rettie, *Ed. Med. Journal,* Sept., 1917.

Take the question of toxins. In a rabbit of 2 kilos weight there is, say, 100 Cc. of blood. Such a rabbit can stand without inconvenience, say, for a very safe estimate 20 Cc. eusol intravenously; this contains 0.05 Gm. $HClO$; obviously 0.05 Gm. of hypochlorous acid in 100 Cc. of blood can have no possible action as a direct antiseptic. On the other hand, ricin, a vegetable protein poison extracted from castor-oil beans, very closely resembling the bacterial toxins, when administered intravenously to a 2-kilogram rabbit in a dose of 0.001 Mgm., kills the animal. A very small amount of hypochlorous acid would suffice to neutralize this dose, if it could reach it.

Hitherto the treatment of conditions due to organic toxins has been based on the conception of a specific antidote; for example, take diphtheria. The method of treating the disease is to inject into the patient the serum of an animal which has been rendered highly immune to the diphtheria toxin. This serum has the power of neutralizing the toxin, but it is a specific power; it cannot neutralize the toxin produced by other organisms, *e. g.,* tetanus. The interest of the method of treatment by intravenous injection of hypochlorous acid lies in the fact that we are able to introduce into the blood a considerable quantity of a strong chemical reagent which will act in a general and not a specific manner.

The chemical reaction between hypochlorous acid and blood is naturally very complex. When hypochlorous acid or hypochlorites act on proteins, the first products are chloramines. In these compounds, which have been studied by Chattaway, Langfield, and later by Dakin, chlorine displaces the hydrogen attached to the nitrogen, giving compounds containing the group NCl.

These substances give the reactions for free chlorine and are themselves antiseptics of considerable value. As they are formed in the wound or in the blood stream in intravenous injection, and may continue to exist as such for some time, they may prove to have an important bearing on the reactions of the body. They ultimately break down to aldehydes, nitriles, carbon dioxide, ammonia, etc. Work on these compounds as antiseptics has been carried out by H. D. Dakin[13] and others working in Professor Cohen's laboratory at Leeds, and two chloramine antiseptics have been prepared and are now in extensive use. They are known as chloramine T, which is p-toluene sodium sulphochloramide, $CH_3C_6H_4SO_2NaNCl$, and dichloramine T, toluene-p-sulphodichloramine, $CH_3C_6H_4SO_2$-NCl_2 The former is soluble in water and is used in a strength of 0.5 per cent. The dichloramine is insoluble but dissolves in eucalyptol, which is then diluted with paraffin oil.

In the exigencies of war surgery a large variety of antiseptics, including several synthetic dyes, have been tested, but the general conclusion seems to be that hypochlorous acid, one of the oldest antiseptics, still remains the most reliable for general wound treatment.

In eusol the full value of hypochlorous acid is available without the drawbacks inherent in the earlier solutions containing this potent reagent.[14]

AMERICAN-MADE INDIGO.[1]

Indigo, the key to the dye situation in this country, now is being produced in commercial quantities and the solution of the American dye problem—acute since the imports from Germany were cut off—has been found. Not only is America now independent of Germany but we rapidly are moving into a position to hold the dye trade of the world after the war.

[13] Dakin and others, *Proc. Roy. Soc.*, 1916, B. 89, 232, and *B. M. J.*, 1917, 1, 865.

[14] For clinical trials with eusol see *Lancet*, February 5 and 12, 1916.

[1] From Publicity Bureau, E. I. du Pont de Nemours & Co.

These facts were brought out by Dr. Charles L. Reese, chemical director of the du Pont Company, in an address made before the cotton manufacturers of the United States at their recent convention in New York.

The dye problems have been solved, he said, and the du Ponts are at this moment turning out synthetic indigo of the best quality on such a large scale that the commercial success of the undertaking is assured. The laboratory problems were all solved long ago. The manufacturing difficulties now have been overcome and the production of this most important factor in the dye industry is going along according to the most up-to-date process at the company's big plant nearing completion at Deepwater Point, N. J.

Not only is indigo being made in quantity, but the plant is turning out all of the intermediates necessary for its production. In a very short time the indigo plant will be brought to its full capacity, which will supply all of the needs of the United States and Canada.

In addition to the production of indigo, Dr. Reese announced that his company soon will be manufacturing types of the finest basic, acid and direct colors, and a little later will put on the market the alizarine colors with their mostly needed derivatives, namely, the vat colors. Sulphur colors and chrome colors will be put on the market in a comparatively short time. He said that while it is not possible at the present to give definite dates, the plans are progressing very rapidly, considering the difficulties of securing machinery and raw materials, and we feel certain that we will make good our promise to become a large factor in making this country independent in the dyestuff industry.

OLIVE-OIL EMBARGO RELAXED.

The United States consul-general at Barcelona, Spain, cables:

Spanish government, by royal order published April 24, permits, upon application to the general direction of customs within ten days, the exportation of Spanish olive oil of recognized Spanish brands to American countries on the basis of shipments made to those countries during the five years from 1912 to 1916, no country being allowed more than its pro rata share. Shipment must be made in cans or bottles in the case of brands registered after July 31, 1914, or in any kind of containers for brands registered prior to that date.

An export tax of 30 pesetas will be levied on each 100 kilos net. All exports are subject to control and licenses are revocable at any time by the national commission on supplies. (Peseta, par value, $0.193; kilo, 2.2 pounds.)

[The embargo on olive oil of all grades was announced by the Spanish government on September 7, 1917. An export duty of 40 pesetas per 100 kilos was imposed.]

This Spanish decree, permitting export of olive oil under certain regulations, will serve to relieve to a moderate degree only the shortage of this prime necessity in the American market. The embargoes on the export of Italian and French olive oils, which have heretofore largely supplied the United States, have created an acute condition regarding supplies of olive oil, both edible and technical grades. The home production, largely in California, has developed some excellent grades of oil, but is as yet capable of supplying but a very small percentage of the needs of the country for this product. As a consequence olive oil of all grades has advanced to prices that were not thought possible.

VEGETABLE POWDER AS A LARVICIDE IN THE FIGHT AGAINST MOSQUITOES.[1]

A Preliminary Note.

By James K. Thibault, Jr. (Washington, D. C.),
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Scott, Ark.

With the view to finding some larvicide cheaper than crude oil and just as effective, and at the same time available for use in certain places that can be neither oiled nor drained, such as water gardens, outdoor fish pools, rice fields and the like, I have experimented with many substances during the past few years. I have found not the perfect larvicide I sought, but one that meets at least a few of the requirements of perfection, and that I consider well worth a trial by those engaged in the work of exterminating mosquitoes. While not a substitute for oil under all conditions, it is certainly much cheaper than oil, as easy of application and, in most cases, as effective as oil, and it can be used in places where oil would not serve the purpose.

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[1] From the Journal of the American Medical Association, April 27, 1918.

The larvicide in question consists of various vegetable powders, including the familiar pyrethrum or insect powder of the stores. In fact, all my earlier work was done with the pyrethrum powder, which gave excellent results. But it was so expensive that, had it been generally used and recommended for this work, the cost would have become prohibitive within a short time. So I determined to find some similar powder possessing the good qualities of pyrethrum and at the same time being available to every one, and not subject to the speculative manipulations of the market.

As the larvicidal action of pyrethrum powder is purely mechanical, I considered it possible to produce a powder from the common weeds of the neighborhood that would be just as effective, and, indeed, I have found this to be the case. The weeds and grasses of nearly every species in the neighborhood, when dried and reduced to powder of the proper fineness, gave very good results, and it is not at all necessary to select any particular species in order to produce an effective powder.

A good powder should spread quickly and evenly over the surface of water even if thrown on by the handful, pushing the resulting film to all parts of the surface to be treated. It is, however, much more potent when applied in the form of a spray over the entire area of the larger pools. The covering capacity should be from 3,500 to more than 4,000 square feet per pound of powder.

Perhaps the greatest disadvantage in the use of the powder is its short period of effectiveness—probably only a few minutes—but it is so deadly that, once the larvæ come in contact with it, they die in a few minutes, even when immediately removed to another receptacle. The powder loses its effectiveness as soon as it is thoroughly wet.

I have found it very effective for killing such well-known species as *Anopheles quadrimaculatus, Culex quinquefasciatus, Culex abominator, Aedes coclumbiæ* and *Psorophora cyanescens*. Of these the species with short, thick air tubes such as *Anopheles, Aedes* and *Psorophora* are easily killed, while the species of *Culex* with very long, slender tubes are more resistant, *Culex abominator* being the most resistant species I have had to deal with.

These studies have been made in connection with the work of this bureau on the relation of mosquitoes and malaria to agriculture, under the general supervision of Dr. W. D. Hunter, with Mr. D. L. VanDine in charge of the field work.

SUGARLESS EFFERVESCENTS.[1]

The increased supplies of saccharin at more moderate prices make it now possible to use saccharin as a sweetener in effervescing preparations, the demand for which will increase with the advent of spring. The unsweetened effervescents which have been offered in certain quarters have not met with a ready acceptance by the public, and if the trade in these preparations is to be retained it is necessary that the substitute should resemble the original article as nearly as possible. On this account we publish the following recipes which were devised by Professor John Attfield some years ago:

Sodii Citro-Tartaras Effervescens

Sodium bicarbonate	17 oz.
Tartaric acid	9 oz.
Citric acid	6 oz.
Saccharin	8 gr.

Mix the powders thoroughly, place them in a dish or pan of suitable form, heat to between 200° and 220° F., and when the particles of the powder begin to aggregate stir them assiduously until they assume a granular form; then by means of suitable sieves separate the granules of uniform and most convenient size and preserve the preparation in well-closed bottles.

The usual dose of this saccharinated preparation is one to two small teaspoonfuls, it being somewhat stronger than the article containing sugar. The formula given above would in the ordinary way include five ounces of sugar, and part at least of this bulk may be made up by employing dried sodium sulphate, but as this increases the activity of the preparation, the dose is best kept at the quantity stated above. For summer trade the following are useful:

Ginger-beer Powders.

A.

Ginger in powder	60 gr.
Sodium bicarbonate	300 gr.
Saccharin	4 gr.
Oil of lemon	8 min.

Mix thoroughly. Divide into twelve equal portions, wrapping each in blue paper.

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[1] From *The Chemist and Druggist,* April 20, 1918.

B.

Tartaric acid (in powder)	360 gr.

Divide into twelve equal portions, wrapping each in white paper.

Directions for use: Mix the contents of a blue packet with a tumblerful of water; add the contents of a white packet; stir, and drink during effervescence.

LEMONADE POWDERS.

A.

Sodium bicarbonate	300 gr.
Saccharin	4 gr.
Oil of lemon	15 min.

Mix thoroughly. Divide into twelve equal portions, wrapping each in blue paper.

B.

Tartaric acid (in powder)	360 gr.

Divide into twelve equal portions, wrapping each in white paper.

Directions: As for ginger-beer powders.

SHERBET.

Sodium bicarbonate	5 oz.
Tartaric acid	5 oz.
Saccharin	24 gr.

Dry the bicarbonate and acid separately. Mix the saccharin with the dry bicarbonate, and add—

Oil of lemon	60 min.

Add the tartaric acid and mix. Preserve the sherbet in a dry, well-corked bottle.

In regard to the use of saccharin in place of sugar, the question of its alleged harmfulness it still being raised by people who are unmindful of the fact that saccharin was exhaustively tested physiologically over thirty years ago and found to be harmless to the human economy. For many years saccharin has been employed in aërated waters and as a sweetening agent in diabetic dietary without ill effect. Within the past two years larger quantities have been consumed than ever before, and so far no case has been brought forward of any harm that has resulted.

FIXING OF THE RESALE PRICES OF ARTICLES TO BE FORBIDDEN BY FEDERAL TRADE COMMISSION.

The Federal Trade Commission has issued the following formal statement of its policy on the question of fixing resale prices, a subject that has long been a matter of contention and of extended litigation affecting the drug trade.

For a considerable time there has been a controversy throughout the country over the question of the right of manufacturers, wholesalers, etc., fixing resale prices at which their articles could be sold, and the right to maintain such resale prices has been contended for by them, and the question whether such right exists has been brought before the Federal Trade Commission numerous times.

Many hearings have been had, many complaints have been made, and much consideration has been given to the subject by that commission. Many business concerns have been refusing to sell to customers who would not agree to maintain the resale price fixed by the seller.

First Case Disposed of.—The Federal Trade Commission has just disposed of the first of these cases in which complaints have been issued charging violations of law through fixing the resale price of articles, and an order to cease and desist from this practice has just been issued by it in the case of Chester Kent & Co. (Inc.), of Boston, manufacturers of proprietary medicines.

Attorneys for the company admitted that in the past the practices complained of had been in use. The order, the first in cases of this character, forbids the company to—

(*a*) Indicate to dealers the prices for which its proprietary or patent medicines shall be resold.

(*b*) Securing agreements from dealers to adhere to such prices.

(*c*) Refusing to sell to dealers who fail to adhere to such prices.

(*d*) Refusing to sell to dealers who fail to adhere to such prices upon the same terms as dealers who do so adhere.

(*e*) Furnishing any advantage to dealers who adhere to the resale prices, while refusing similar treatment to dealers who do not adhere to the prices.

This order of the commission follows the decision of the Supreme Court of the United States in the American Graphophone Co. case lately decided by it.

Some of the most distinguished lawyers in the United States have appeared before the commission to argue this question, as well as many of the leading business concerns of the country, some of whom have insisted that the maintenance of resale prices was proper, and others who have contended that it was not. Almost all of the large department stores of the country have been heard in opposition to it.

After full consideration the Federal Trade Commission has decided to issue complaints against all business concerns who refuse to sell unless the purchaser will agree to maintain a resale price fixed by the seller. The case just decided is the first formal finding by the commission to that effect. When once an article has passed from the maker to a purchaser he owns it, and the owner of such article may sell it at any price that he chooses, provided he does not himself sell it at such price as to be below cost, and thus thereby enter into unfair competition with other retailers selling the same article.

CONGRESS MAY HAVE TO ACT.—This decision is going to be open to considerable controversy in relation to the subject matter thereof, and the matter will probably have to be settled by an act of Congress in the manner suggested by Mr. Justice Brandeis in his concurring opinion in the Supreme Court of the United States, in the case of the American Graphophone Co. The Stephens bill, which is now in Congress, is in relation to that matter, but in the estimation of many business men and others it is thought to be broader than it should be. It may be that resale prices can be so regulated by placing the power somewhere protecting against unfair prices as to make it work equitably, and be a fair method of competition in commerce, but that question will undoubtedly have to be settled by congressional action.

COD-LIVER OIL FROM NEWFOUNDLAND.[1]

Large quantities of cod-liver oil are produced in Newfoundland as a by-product of the fishing industry, but the quality of the refined oil was formerly much inferior to that prepared in Norway, and the Newfoundland oil was consequently not greatly esteemed in the United Kingdom for medicinal purposes.

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[1] March Issue of *Chamber of Commerce Journal*, London, England. Reprinted from *Commerce Reports*, April 23, 1918.

Considerable attention has, however, been devoted recently in Newfoundland to the improvement of the quality of the cod-liver oil produced in the island. In 1910 the government procured the services of a Norwegian expert, who has been engaged in the manufacture of cod-liver oil in the Lofoden Islands, to instruct the Newfoundland refiners in the methods of preparing the finest oil. A system of government inspection of oil refineries was also introduced, and in May, 1916, an "Act respecting the refining of cod-liver oil" was passed by which it was made compulsory for every refiner of the oil in Newfoundland to obtain a license and to observe certain rules and regulations in the preparation of the oil. Under the provisions of this act no refined cod-liver oil is now allowed to be exported from Newfoundland without having been inspected and branded by a government officer. The result of these measures has been to bring about a great improvement in the quality of Newfoundland cod-liver oil, and it is claimed that the refined oil is now equal to the best Norwegian oil.

The production of refined cod-liver oil in Newfoundland has increased considerably in the last few years, but the bulk of the oil obtained is still of common quality. In 1913–14, 1,054,208 gallons of common cod oil were exported from Newfoundland, as contrasted with 26,218 gallons of refined; in 1914–15, 1,239,040 gallons of common against 47,170 gallons of refined; and in 1915–16, 1,313,280 gallons of common against 142,637 gallons of refined. It is evident that a much greater output of the refined oil is possible if satisfactory markets can be found for the product.

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

Destruction of the Organic Matter in Urine.—Two Grms. of magnesium nitrate are dissolved in 20 Cc. of the urine, and the solution evaporated gently until a yellowish-brown residue is obtained. This is strongly ignited, and the charcoal then rapidly burns to a white residue. The amounts of sulphur estimated in the residue agree closely with those obtained by fusion with the ordinary fusion mixtures, and the method has the advantage that the oxidation proceeds less violently, and that less foreign material is introduced. Calcium nitrate may be used instead of magnesium nitrate, but is less rapid in its action. (L. Cordier, *J. Pharm. Chim.,* 1917, 16, 363–367. From *The Analyst.*)

Catalytical Bleaching of Oils.—The use of catalytic agents, such as finely divided nickel in the hydrogenation of oils, says the *Oil and Color Trade Journal,* 53 (1918), 123, having proved so successful, it is probable that the employment of these in other directions may follow as a matter of course. In the bleaching of oils, for instance, catalytic agents such as finely divided lead and animal charcoal have been of service, as well as oleate of manganese, etc. In a paper recently published in a contemporary, experiments were described showing the influence of several catalytic agents upon tallow, palm oil and beeswax when a current of air is blown through the melted material. The catalysts employed were air-bleached palm oil, oleates of manganese, copper, cobalt, lead, iron and nickel, the silkstone soap of A. Finlay and Company, Belfast, and the cobalt soap preparation from the latter. In the case of the palm oil, bleaching occurred both with and without the catalysts, but with the latter the time requisite for bleaching was shortened, especially with cobalt and manganese salts. The experiments with beeswax and tallow were not so successful. (From the *Journal of Industrial and Engineering Chemistry.*)

Test for Albumin in Body Fluids.—Leone's reagent superposes the precipitating properties of three precipitants. He pours into 100 Cc. of distilled water, heated, 10 Gm. of potassium bichromate. After filtering and cooling, 100 drops of glacial acetic acid are added and, a few minutes later, 100 drops of a 25 per cent. solution of pure sulphuric acid. Of the reagent thus prepared, 5 Cc. are transferred to a test tube. Then the urine or other protein solution under examination is added with a pipette. At the zone of contact a whitish ring forms. When there is much albumin present, delicate whitish threads can be seen extending down into the fluid below like wisps of smoke. The reaction occurs at once or in four or five minutes. There may be further two zones of precipitation, separated by a limpid zone. The reaction is not modified by the presence of iodine, mercury or salicylates in the urine. From the intensity of the whitish ring, its height and the rapidity with which it forms, the proportion of albumin present can be estimated. If there is no albumin a brown ring forms from the combination of the urea with the reagent. When the whitish ring forms at once, with only a few Cc. of urine, there is always more than 0.5 per thousand albumin present. If the ring takes several minutes to form, there are only a few Mg. of albumin. (From the *Policlinico, Rome,* through *The Journal of the American Medical Association.*)

Determination of Lactic Acid in the Presence of Other Organic Acids.—On oxidation with chromic acid, lactic acid yields acetic acid, carbon dioxide, and water, whilst other organic acids, such as tartaric, citric, malic, and oxalic acids, give only carbon dioxide and water. After volatile substances (volatile acids, alcohol, esters, etc.) have been distilled off, a portion of the residual solution corresponding with about 40 Cc. of $N/1$ sodium hydroxide solution is treated with 30 Cc. of 50 per cent. chromic acid solution and 20 Cc. of dilute sulphuric acid, the mixture is diluted to 100 Cc., boiled under a reflux condenser for 15 minutes, cooled, and the acetic acid formed is separated by distillation, and titrated. About 3 per cent. of the lactic acid present is destroyed completely by the oxidation, and the results calculated from the acetic acid found are correspondingly low. A small portion of the lactic acid distils over with the volatile acids. If only acetic and formic acids are also present, it is possible to determine this quantity of lactic acid by titrating the distillate and determining the molecular equivalents of the acids in the usual way; the formic acid must, of course, be determined separately. (P. Szeberenyi *Z anal. Chem.*, 1918, 56, 505–506. From the *Journal of the Society of Chemical Industry.*)

COMPARATIVE EXAMINATION OF PURE AND COMMERCIAL INULINS.—Under the influence of diastases inulin is decomposed within the chicory root, with the formation of new compounds, termed inulides. These do not reduce Fehling's solution, but are attacked by the hydrolytic diastases in yeasts, which transform them into fermentable reducible sugars. On the other hand, pure inulin is not attacked by active yeasts or by S. Pombe. Comparative tests with samples of pure and commercial inulins, in which 1 Gm. of the sterilized samples was treated with 25 Cc. of yeast water of different origin, showed that the method was capable of detecting the presence of inulides. Pure inulin yielded 0.007 per cent. of alcohol, whilst commercial French inulin yielded 0.045 per cent., and German inulin 0.310 per cent. of alcohol when fermented with S. Pombe, —J. Wolff and B. Geslin. (*Ann. Chim. anal.*, 1917, 22, 241–242.) From *The Analyst.*

CONSTITUENTS OF FORMOSAN LEMON GRASS OIL.—The terpene isolated from lemon grass oil from Formosa gave, on reduction with sodium and alcohol, a derivative corresponding closely with dihydromyrcene, yielding dihydromyrcene tetrabromide, m. pt. 87°–88° C. It was further reduced by hydrogen and platinum to 2.6-dimethyloctane. On oxidation with alkaline permanganate it yielded succinic and oxalic acids. The identification of this terpene with myrcene is considered complete. In addition, the oil contains an aldehydic substance, other than citral, which has not yet been isolated. (*J. Chem. Ind.*, Tokyo.) From *The Journal of the Society of Chemical Industry,* February 15, 1918.

DELICATE REACTION OF THE NITRILES.—When a solution of a nitrile (aliphatic or aromatic) is treated with an equal volume of hydrogen peroxide (12 vols. per cent.) and 2 or 3 drops of a 5 per cent. solution of ferric chloride, hydrogen cyanide is produced on boiling. This can be detected by test papers made by treating filter-paper with picric acid (1 per cent.), drying, and then immersing the paper in a 10 per cent. solution of sodium carbonate. If much nitrile is present the paper turns blue, but with smaller quantities a red or brownish-red coloration is observed. Very small quantities of nitrile can be detected in this way.—S. Dezani. (*Atti R. Acad. Sci. Torino*, 1917, 52, 826–833.) From *The Analyst*.

PREPARATION OF TANNIC ACID, GALLIC ACID, AND PYROGALLOL.—Tannin was extracted from Japanese gall nuts by four successive treatments with water at 20° to 30° C., and the residue was pressed. In this way a 13 per cent. solution of tannin containing 82 per cent. of the theoretical quantity was obtained. Tannic acid was prepared by concentrating the extract to 20 per cent., extracting it with half its volume of ether, and evaporating the ethereal extract. About 75 per cent. of the tannin in the aqueous extract was obtained. For the preparation of gallic acid the residual solution from the tannic acid preparation was concentrated to 20 per cent., and treated with 15 to 20 per cent. (by vol.) of sulphuric acid (66° B., sp. gr. 1.84), and the precipitated black mass was dissolved in water, decolorized with animal charcoal, and finally recrystallized from water. The yield was 62 per cent. of the tannin contained in the residual solution. Pyrogallol was prepared by heating the crude gallic acid with about 3 times its volume of water in an autoclave at 210° C. The crude product (yield, 63.5 per cent. of the gallic acid) was purified by crystallization from pure benzene.—M. Mito. Kogyo-Kwagaku-Zasshi (*J. Chem. Ind.*, Tokyo), 1917, 20, 720–736.

ESSENTIAL OIL OF ARTEMISIA ANNUA.—The work of Imada on the essential oil of *Artemisia annua* has been extended. The oil used had the following characteristics: Sp. gr. at 16°/4° C. 0.907798; optical rotation, 16.19°; acid value 1.82; ester value, 34.58; ester value after acetylation, 63.54. A minute quantity of an oil with an odor of cumic aldehyde was extracted by sodium bisulphite solution. The remainder was steam-distilled, yielding an oil of low specific gravity. The brown residue, amounting to about one fifth of the original oil, distilled between 128° and 182° C. at 10 Mm. pressure. The fraction of the light oil distilling from 176° to 181° C. contained cineol. The fraction distilling from 181° to 190° C. contained a ketone yielding a semicarbazone melting at 96° C., from which concentrated hydrochloric acid regenerated the pure ketone, having the formula C 10, H 16, O, boiling at 71°–75° C. at 11 Mm., and at 182° at 760 Mm. Its sp. gr. at 14°/4° C. was 0.8906, refractive index 1.4695 at 18.5° C., and it was optically inactive.

Catalytic reduction of hydrogen yielded a tetrahydroketone, forming a semicarbazone melting at 134°–135° C. The pure tetrahydroartemisia-ketone boiled at 73° C. at 15 Mm., and at 173° C. at 760 Mm.; sp. gr. at 19.5°/4° C., 0.8262, and refractive index, 1.42425. The higher-boiling fractions of the oil (190°–210° C.) yielded a semicarbazone melting at 236°–237° C., which when treated with dilute sulphuric acid yielded a solid ketone, m. pt. 175° C., with all the properties of l-camphor.—Asahina and Yoshitomi. (*J. Pharm. Soc. Japan,* 1917, No. 424, 1. *Perf. and Essent. Oil Rec.,* 1917, 8, 353–354. From *Journal of the Society of Chemical Industry,* February 15, 1918.

Determination of Metallic Iron in Ferrum Reductum.—The author finds that the simple method described by Winkler (*Z. angew. Chem.,* 1917, 64) is not trustworthy, since the increase in weight of the sample does not attain a constant value even after the ignition in air for 15–20 minutes has been repeated five or ten times; moreover, by the prolonged ignition the triferric tetroxide originally present in the ferrum reductum is partially converted into ferric oxide, with the result that the percentage of metallic iron found is too high. The author has examined the official methods adopted in different countries. He recommends that in addition to the total iron, the metallic iron be estimated by Merck's mercuric chloride method; 25 Cc. of the filtrate should be used, the solution of potassium permanganate should be dilute (2–2.5 Gm. per liter), and the confirmatory iodometric estimation may be omitted. The author has examined a method in which bromine instead of iodine is used for the solution and estimation of the iron. The method fails on account of the unavoidable loss of bromine vapor during the estimation.—A. Eberhard. (*Arch. Pharm.,* 1917, 255, 357–381.) From *Journal of the Society of Chemical Industry,* January 31, 1918.

Detection and Estimation of Zinc in Water.—The film test will detect 1 part of zinc in 200,000 if it is present as bicarbonate, but where it is present in other combinations the test fails. The opalescence test with ammonium sulphide as reagent will detect 1 part in 100,000, and with ferrocyanide as reagent may detect 1 part in 1,000,000 if certain conditions can be secured. It is pointed out that if a sample of water contains both zinc and visible matter in suspension, most of the zinc will be found to be in suspension and not in solution.

The test with ammonium sulphide is made as follows: To 100 Cc. of the sample contained in a test mixer, 1 Cc. hydrochloric acid is added, and, after shaking, 2 Cc. of ammonium sulphide solution. Simultaneously 100 Cc. of zinc-free tap-water is similarly treated. If at the end of fifteen minutes no difference can be seen between the sample and the tap-water, the sample contains less than 1 part of zinc in 100,000. If the sample develops a visible opalescence, the presence of zinc cannot necessarily be inferred. A further portion of the sample must be freed from iron and alumina, and then tested as described and the opalescence compared with that developed in standard solutions of known zinc content.

The ferrocyanide test should be applied twice to waters carrying suspended matter, first to 100 Cc. of the unfiltered water, and then to 100 Cc. of the filtered water. To 100 Cc. of the sample 1 Cc. of dilute (1:5) hydrochloric acid is added, and after a minute 1 Cc. of a 1 per cent. solution of potassium ferrocyanide not more than a few hours old. The opalescence, if any, produced is compared with standards in the usual manner, but to detect 1 part in 1,000,000 or estimate larger quantities accurately the standards must be prepared from water very similar except that it is zinc free. Sometimes the same water, before contamination by zinc, is available. In other cases, if the sample has been analyzed, an approximately similar solution can be prepared artificially. The use of distilled water for standards may lead to over-estimation of the zinc by as much as 100 per cent. (R. Meldrum, *Chem. News,* 1917, 116, 271–272, 295–296. From *The Analyst.*)

Separation and Estimation of Lactic, Succinic, and Malic Acids in Wines.—The method of separation of these acids from other acids in wine depends on their solubility in a mixture of alcohol and ether; the acids are then separated from one another by making use of the different solubilities of their calcium salts in alcohol. Fifty Cc. of the wine are neutralized with N/I potassium hydroxide solution, and a quantity of 5 per cent. mercuric acetate solution is added just sufficient to precipitate the tannins; the mixture is heated to 50° C. and filtered, the insoluble portion being washed twice with hot water. To the filtrate is then added N/I sulphuric acid equal in volume to the quantity of N/I potassium hydroxide solution, together with an amount equivalent to the difference between the total alkalinity of the ash expressed as potassium bitartrate corresponding with the amount of total tartaric acid in the wine. The solution is now evaporated to a syrup, water is added, and the evaporation repeated so as to expel all volatile acids. The residue is treated with a few drops of water, 2 Grms. of animal charcoal, and a quantity of sand; 25 Cc. of 95 per cent. alcohol are added, and the mixture is extracted with 50 Cc. of ether. After the ethereal solution has been decanted through a filter, the extraction is continued with successive quantities of 15 Cc. of a mixture of equal volumes of alcohol and ether. The extract is then evaporated to about 5 Cc., 0.2 Grm. of animal charcoal and 10 Cc. of water are added, the mixture is filtered, and the precipitate washed with a small quantity of hot water. The filtrate is concentrated, neutralized, while boiling, with alkali (calcium hydroxide) solution, again evaporated to about 8 Cc., and treated with one drop of 50 per cent. acetic acid and 90 Cc. of warm 95 per cent. alcohol. The mixture is heated to boiling, filtered, and the precipitate of calcium malate and succinate washed with 85 per cent. alcohol. An estimation of calcium in the filtrate gives the corresponding quantity of lactic acid. The precipitate is then dissolved in boiling water (a small quantity of calcium phosphate may remain insoluble), the solution is evaporated to 8 Cc., 1 Cc. of glacial acetic acid and 90 Cc. of 95 per cent. alcohol are added, the mixture is boiled, and the precipitated calcium malate collected on a filter and washed with warm 85 per cent. alcohol containing a trace of acetic acid. The quantities of calcium in the precipitate and filtrate give the amounts of malic and succinic acids respectively. Citric acid, if present in the wine, is precipitated with the calcium malate. In the case of sweet wines, the wine after neutralization, removal of tannins, and treatment with sulphuric acid, is evaporated to a syrup, and the latter is extracted several times with a mixture of 20 Cc. of alcohol and 50 Cc. of ether. The extract is then evaporated and treated as described. In normal wines, the succinic acid content is usually about 0.70 Grm. per liter; the quantities of lactic and malic acids vary considerably according to the origin and nature of the wine. (J. Laborde, *Comptes rend.*, 1917, 165, 793–795. From *The Analyst*.)

Estimation of Sulpho Ethers in Urine.—In Salkowski's method (*Virchow's Arch.*, 79, 552) metallic sulphates are estimated by precipitation with barium hydroxide and barium chloride and treatment of the precipitate with dilute nitric acid, whilst the combined sulphonated compounds, which are present in the filtrate as barium salts, are decomposed by boiling with hydrochloric acid and then precipitated with barium chloride. According to Gauvin (*Bull. des Soc. Pharm.*, June, 1914), a portion of the sulphonated ethers remains in the barium precipitate after the acid treatment, so that the results obtained by Salkowski's method are too low. This may be obviated by precipitating the sulphates alone, and then estimating the total sulphur compounds in another portion of the urine after hydrolysis by boiling for fifteen minutes with a fifth part of its volume of hydrochloric acid. The sulphur in the sulphonated ethers is then found by difference. The results thus obtained are from 6.5 to 8.6 per cent. higher than those given by Salkowski's method. Extension of the period of heating during the hydrolysis does not cause the results to be appreciably higher. (L. Cordier, *J. Pharm. Chim.*, 1917, 16, 360. From *The Analyst.*)

Purification of Water with Isotonic Sodium Hypochlorite Solution.—Fralick has proposed and demonstrated the use of two chemicals for water purification in emergency outfits (Lister bags), so as to produce a safe water, entirely free from objectionable tastes and odors. To do this he has recommended the use of the isotonic sodium hypochlorite solution as a disinfection and the neutralization of the excess sodium hypochlorite by peroxid of hydrogen sodium hypochlorite + hydrogen dioxid = sodium chlorid + water + 20, while the effectiveness of this method had been repeatedly demonstrated at his laboratory, field tests under army conditions were conducted and the testimony of a number of sanitary experts obtained. There was a unanimous opinion expressed that water neutralized with the hydrogen dioxid was entirely free from any objectionable or even noticeable taste or odor, while bacterial tests demonstrated its freedom from micro-organisms. In view of the disagreeable and probable injurious qualities of water disinfected with calcium hypochlorite, in emergency outfits (Lister bags), and in view of the fact that troops avoid drinking this water, Fralick recommends its discontinuance. (*Medical Record of New York* through *Journal American Medical Association.*

OLEIC ACID CONTAMINATED WITH IRON CAUSES SPONTANEOUS COMBUSTION.—In a technical process, fibers were oiled with oleic acid and then conveyed to bins in a current of air. Spontaneous combustion ensued. The oleic acid was found to have a normal iodine value, and other tests revealed nothing of a suspicious nature. It contained, however, iron equivalent to 0.1 per cent. of ferric oxide. This was proved to act as a catalyzer in promoting oxidation. This degree of contamination with iron is not uncommon with commercial oleic acid. Shaking the acid with dilute hydrochloric acid does not remove the iron.—W. S. Hughes (*J. Ind. Eng. Chem.*, 1917, **11**, 2280. From *Pharm. Journ. and Pharmacist*).

THE COMMON FROG'S HEART UNSUITABLE FOR DIGITALIS STANDARDIZATION.—The isolated heart of the common frog, *Rana temporaria*, should not be used for accurately standardizing digitalis, since it absorbs part of the active principles, and therefore behaves differently from the heart of the edible frog, *R. esculenta,* which alone should be employed for the purpose. The common frog's heart may prove useful as a control; and rough determinations within ten per cent. of accuracy may be made with it with digitalis and strophanthus. M. Krough (*Ugeskrift for Laeger: J. Amer. Med.* Assoc., 1917, 68, 1672. From *Pharm. Journ. and Pharmacist*).

CHLORINE USELESS AGAINST MOSQUITO LARVÆ.—In view of the fact that a very small amount of free chlorine is sufficient to render a polluted water safe for drinking, experiments were made to see if it had an value as a larvicide on aquatic larvæ. It was found, however, that the larvæ of the mosquito, *Stegioma fasciata,* in tap water, or in stagnant water, their natural habitat, were unaffected by chlorine in a proportion of 1:25,000. In a 1:100,000 dilution all were killed in 24 hours. This proportion, however, is greatly in excess of what could be practically used. It is concluded that chlorine is useless for killing mosquito larvæ.—J. W. S. MacFie (*Report of Accra Lab. Trop. Diseases, Bull.: Chem. Abstr.,* 1917, **11**, 2247. From *Pharm. Journ. and Pharmacist*).

A NEW ACID SODIUM PHOSPHATE.—This salt, $Na_4P_6O_{17}$, for which the name sodium polyphosphate is proposed, is easily prepared by evaporating mixtures of sodium hydroxide or carbonate with phosphoric acid and heating the residue finally to a bright red heat in a muffle. The product is a vitreous mass slowly soluble in cold water, more rapidly dissolved on warming. The solution is nearly neutral to both phenolphthalein and methyl orange. It is difficult to obtain the pure salt, since it has a powerful corrosive action, especially near its melting point, on vessels of all material. Platinum used with it becomes so brittle that it may be torn like paper; nickel was attacked until the mixture consisted entirely of nickel and sodium pyrophosphates; glaze of porcelain was badly corroded, alkalies being removed and silica liberated; even quartz dishes were perceptibly attacked and silica contaminated the salt contained in them.—J. H. Smith (*J. Soc. Chem. Ind.*, 1917, **36**, 419. From *Pharm. Journ. and Pharmacist*).

MEDICAL, PHARMACEUTICAL AND DISPENSING NOTES.

Methods of Control of Clothes Louse (*Pediculus Humanus Vestimenti*).—W. Moore, of St. Paul, shows that sachets are not sucessful. Talc, 20 Gm., creosote, 1 Cc., and sulphur, 0.5 Gm., is six times as effective a louse powder as naphthalene, creosote and iodoform, causing less irritation to the skin and, being dry, is easier to apply. Impregnation of the underwear does not appear promising, but a cheesecloth suit impregnated with saturated solution of sulphur in creosote could be successfully worn outside the underwear. Chlorpicrin can be used as a fumigant, penetrating the clothing and killing the lice in all parts of the clothing in fifteen minutes and the eggs in thirty minutes. By increasing the heat in the fumigation chamber, the time required to kill the eggs could be reduced. (From *The Journal of the American Medical Association*, March 23, 1918.)

Ameba Found in Trench Fever.—Truidin is convinced that the infectious disease he describes, known as "trench fever," is a disease sui generis. Also, that the ameba he found in the blood stands in some causal relation to it. He found the protozoon in 75 per cent. of his twenty-four cases, but exclusively during the first three days of the disease. The blood showed the characteristics of a severe blood disease. Coagulation was retarded; in some it began at the tenth minute, in others not until the twenty-third. The average was eighteen minutes. (From *Russkivy Vrach*, Petrograd, through the *Journal of the American Medical Association,* April 27, 1918.)

Benedict's Test for Sugar in Urine.—This solution for qualitative work, recommended by Dr. P. J. Cammidge as a test for sugar in the urine, according to the *Lancet,* is prepared as follows:

A.	Sodium or potassium citrate	173	Grams
	Sodium carbonate, anhydrous	100	Grams
	Distilled water	700	Cc.

Dissolve by the aid of heat.

B.	Copper sulphate, pure	17·3	Grams
	Distilled water	100	Cc.

Cool the solution to the room temperature, and pour *B* into *A,* slowly and with constant stirring. Make up to 1,000 Cc. with distilled water. (*National Druggist.*)

COMMERCIAL AND TRADE INTEREST.

Celluloid Substitute.—Considerable interest has been aroused in the non-combustible substitute for celluloid which has been invented by a professor in a Japanese university, and for the manufacture of which a company has been organized in Japan. The factory buildings are now in course of construction and it is planned to begin in April of this year, or soon after, the manufacture of waterproof cloth, composition tiles and insulators. As soon as the machinery, which has been ordered in the United States, arrives, the manufacture of imitation leather, linoleum, stained glass, marble, lacquers and varnishes will be started. Patent rights have been obtained for the process in Japan and have been applied for in Great Britain, France and the United States. Of the twenty-one patents applied for in this country, eleven have actually been granted under date of November 6, 1917, and bear serial numbers 1,245,818 and 1,245,975 to 1,245,984, inclusive. (From the *Journal of Industrial and Engineering Chemistry,* April 1, 1918.)

Procaine, American Novocaine.—One of the first American owned and controlled companies to receive a license for the manufacture of drugs formerly made in Germany was the Rector Chemical Company, of New York, which holds license No. 5, for the manufacture of "Procaine," the drug introduced by the Germans as

"Novocaine." The name is a contraction of pro-cocaine, the drug being a substitute for cocaine, as explained by Dr. Julius Stieglitz in an article in the Journal of the American Medical Association of February 23, who announces that the Rector Chemical Company has had the assistance of Professor Bailey of the University of Texas in perfecting their manufacturing processes.

MAGNESIUM PRODUCTION IN THE U. S. A.—Prior to the war practically all of the magnesium used in the United States was imported from Germany, but since the stocks in this country were exceedingly small, it practically disappeared from the market in less than twelve months. The price reflected its extreme scarcity. In January, 1917, the American Magnesium Corporation was organized at Niagara Falls, N. Y., for the purpose of building a plant for the manufacture of magnesium and magnesium alloys. These works are now in operation and are producing the metal in such large quantities that the price has been greatly reduced and is rapidly approaching the quotations prevailing before the war. (*U. S. Iron Trade Rev.,* January 24, 1918.)

NEW SOURCE OF ALCOHOL.—As a commercial possibility, the nipa palm, abounding in the swamps of the Philippine Islands, seems to be unusually attractive, both as a producer of sugar and of alcohol. Already a quantity of the sap is used by Manila distillers in making what is regarded by many persons as the best alcohol manufactured. It is claimed that nipa furnishes the cheapest raw material in the world for the manufacture of alcohol and that denatured alcohol made in this way as a fuel for gasoline motors is cheaper than gasoline and fully as efficient. It is further stated that with a motor built for the use of alcohol this fuel would be twenty to thirty per cent. better than gasoline. There are over one hundred thousand acres of nipa swamp now available in the Archipelago, of which about 90 per cent. have never been touched, and it is estimated that the untapped swamp area of this island would yield fifty million gallons of alcohol fuel every season. (From the *Journal of Industrial and Engineering Chemistry,* April 1, 1918.)

MAIZE OIL.—The recovery of maize oil has been made compulsory in Hungary, and it is hoped to obtain 1,200 wagon loads compared with 300 last year. Maize oil is also recovered in Rumania, where one large mill in Bucharest alone produces daily 30 tons of maize oil and 90 tons of residue, which is used as horse fodder. It has been estimated that by degerminating the whole of the Rumanian maize crop sufficient oil would be produced to increase the daily fat ration in Germany and Austria-Hungary by 12 per cent. (From the *Journal of the Society of Chemical Industry,* March 30, 1918.)

Formosan Caffeine Factory.—Mr. H. Hoshi, president of the Hoshi Drug Manufacturing Co. of Tokyo, states that his Taihoku factory, where he has hitherto carried on experiments in the manufacture of caffeine, will begin the production of the drug on a commercial scale in June, 1918. He expects to be able to produce 5,000 pounds of caffeine per year and to refine the product in his Tokyo factory. The amount of caffeine which can be extracted from Twiwan tea varies from 3 to 10 pounds per 1,000 pounds of raw material, according to the quality of the tea used.

In the Shidzouka tea district of Japan the farmers themselves manufacture caffeine on a small scale. Mr. Hoshi purchases their product and refines it in Tokyo. (By Consul Max D. Kirjassoff, Taihoku, Taiwan, Jan. 7. From *Commerce Reports.*)

Output of Sandalwood Oil in Mysore.—It is stated in the Mysore Administration Report for 1916–17 that the Sandalwood Oil Factory at Bangalore started work on May 10, 1916, and manufactured 50,690 pounds of oil up to the end of June, 1917. A net profit of $163,209 (after paying $262,125 to the forest department for sandalwood) was realized during the period. The value of the oil sold in transit to the London agency amounted to $188,493. The construction of another factory at Mysore at an estimated cost of $97,330 was undertaken during the year, and the work is nearing completion. The report says that the industry is placed on a scientific basis and the Mysore oil commands a good price on the London market. The services of two professors of the Indian Institute of Science as consulting chemists have been secured, and before shipment a sample is taken from each consignment of oil and a certificate of purity issued under their signature. (From *Commerce Reports,* April 6, 1918.)

Camphor Apportioned to United States.—Consul M. D. Kirjassoff cables from Taiwan, Formosa, that camphor apportioned for export to United States is 150,000 kin (198,416 pounds) each month April, May, June, and that apportionment for every three months thereafter will be according to production. (From *Commerce Reports*, April 8, 1918.)

Tests of American and Foreign Chemical Glassware.—Prior to the summer of 1914, the greater part of the chemical laboratory glassware used in this country was imported from Germany and Austria. The cutting off of imports from these countries caused a very serious shortage of glassware in this country, which is not yet entirely overcome. However, within the past two years a number of American manufacturers have increased their production of such ware, or are manufacturing grades of chemical glassware that they did not produce before. It is probable that practically our whole available supply at this time is of domestic manufacture, much of which is ware sold under brand names which were unknown a short time ago.

In order to furnish to chemists information regarding such domestic brands, it was decided by the United States Bureau of Standards to compare them with those of foreign make. These results of the bureau's tests indicate that all of the American-made wares tested are superior to Kavalier and equal or superior to Jena ware for general chemical laboratory use. Results of these tests are given in Technologic Paper, No. 107, "Comparative Tests of Chemical Glassware," Superintendent of Documents, Government Printing Office, for 10 cents. (From *Commerce Reports*, April 16, 1918.)

BOOK REVIEWS.

New Species of Xanthium and Solidago.

Charles F. Millspaugh and Earl E. Sherff, in publication 199, Field Museum of Natural History, Botanical Series, vol. IV, No. 1, give a monographic account of five new species of *Xanthium* and one of *Solidago*.

The writers find the taxonomic status of the various species of *Xanthium* to be very unsatisfactory at the present time, partly because of the difficulty encountered in the past in identifying the older specific names, which in a number of cases were founded upon heterogeneous material, partly since new and undescribed species in herbaria were confused with the commonly known species and, further, because of the surprisingly small number of any one species collected heretofore in a given region, accountable to the contempt with which common weeds such as *Xanthium* are often regarded.

The writers made a detailed study of 5 specimens of this genus, four of which were found in the herbarium of the Field Museum and a fifth in that of the Missouri Botanical Garden. They compared these with *Xanthium americanum* (which has for its fruiting involucre a bur distinctly ovoid in shape, 1.2–1.5 cm. long (exclusive of the beaks), the beaks straight or nearly so, and the entire body, aside from its prickles, more or less glabrous; the prickles straight from base almost to apex where they are usually hooked) and, finding the specimens so different from any form of *Xanthium* known to them, describe these as new species.

Xanthium leptocarpum Millsp. & Sherff has fruiting involucres which are reddish-brown or chestnut colored and are narrowly cylindric-fusiform, not ovoid. The prickles are very few in number and noticeably far apart.

Xanthium arcuatum Millsp. & Sherff has burs more or less of a reddish-purple shade, but the prickles are very numerous and mainly flexed or arcuate from the base to the apical hook.

Xanthium cylindricum Millsp. & Sherff has leaves much like those met with on *Hibiscus militaris* Cav. The burs have a body distinctly cylindrical, not ovoid, and the beaks are curved.

Xanthium crassifolium Millsp. & Sherff has subdeltoid, 3- or 5-lobed leaves and narrowly cylindrical-fusiform echinate burs.

Xanthium acutilobum Millsp. & Sherff has fruiting involucres resembling *Xanthium crassifolium,* differing from it in its subhastate, triangular, thinner and much larger leaves and in the characters of the akene.

An excellent taxonomic description is given of a new species of *Solidago* which the same authors name *Solidago emarginata*. This species has its lower leaves cuneate-oblanceolate in outline and distinctly notched at the apex. Its inflorescence suggests *S. speciosa* var. *angustata* T. & G. (*S. rigidiuscula* Porter) but its leaves do not possess the pronounced reticulations that are so characteristic of those of the latter species. Plates showing the principal characters of the first four Xanthiums and *Solidago emarginata* accompany the article.

HEBER W. YOUNGKEN.

YEAR BOOK OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, 1916. Volume 5. Published by The American Pharmaceutical Association.

The appearance of the fifth volume of the series of "year books" issued by the American Pharmaceutical Association will be welcomed by all students of the advances made in the work of pharmacists and especially by those who are either engaged personally in research investigations or in guiding students who are undertaking such investigations.

The title page informs the reader that this publication is "corresponding to volume sixty-four of the former proceedings of the American Pharmaceutical Association." Since the *Journal* of the American Pharmaceutical Association has taken the place of the large amount of current literature and accounts of the meeting, etc., that formerly was published in the *Proceedings,* this unnecessary statement is not literally true and could very well be omitted.

The present volume follows very closely the style of its predecessors in arrangement, typography, content, etc. The Association data regarding the meetings of the Association, officers and committees, and the constitution, by-laws, rules and investments and the directory of members contains much that is needed for the workers within the Association.

The Report on the Progress of Pharmacy is the portion of the book that will appeal to the general worker in pharmacy and chemistry and contains a review of the valuable contributions to the literature during the year it records. It thus becomes not only an index of progress but a valuable source of information and of reference to original work on all subjects pharmaceutical or allied thereto. Necessarily under the war conditions now existing the references to continental European literature are limited.

G. M. B.

OBITUARY.

JAMES L. BISPHAM.

James L. Bispham was the son of Samuel and Maria Stokes Bispham.

He was born December 19, 1833, on Filbert Street west of Eighth Street, Philadelphia. He attended school in Philadelphia and later at Lawrenceville, New Jersey, graduating in 1850 and delivering the valedictory address.

He learned the drug business with Bullock and Crenshaw, and later attended the Philadelphia College of Pharmacy and graduated with the class of 1854. He at once joined the College. At the time of his death he was the oldest member of the College in point of membership, being a member for sixty-four years. He carried on the drug business at 710 South Second Street from 1854 to 1892. (This was the place of business of Peter Williamson, one of the founders of the Philadelphia College of Pharmacy.) He was a director in the Southwark National Bank and a vestryman of Saint Andrew's Protestant Episcopal Church. In 1859 he was married to Mary Palmer, of Richmond, Virginia. One daughter survives, Mrs. Elizabeth P. Townsend.

He died April 3, 1918, and was buried in the churchyard of Trinity Church, Moorestown, New Jersey.

C. A. WEIDEMANN.

NEWS ITEMS AND PERSONAL NOTICES.

P. C. P. ALUMNI RECEPTION TO DEAN LAWALL AND NEWLY ELECTED PROFESSORS.—On Friday evening, April 26, the Alumni Association of the Philadelphia College of Pharmacy tendered a reception to the newly elected dean and professors. President Howard B. French acted as toastmaster and fathered the theme of the evening, "the new College buildings on the City's new broad park way." The following members of the faculty responded to toasts: Dean LaWall, Professors Sturmer, Stroup, Cook, Youngken, Gershenfeld, Bernstein and Emeritus Professor Sadtler.

HENRY S. WELLCOME VISITS HIS ALMA MATER.—Mr. Henry S. Wellcome, Ph.M., member of the well-known firm Burroughs Wellcome & Co., pharmaceutical manufacturers of London, England, paid a short visit to Philadelphia last month. As the guest of President Howard B. French he enjoyed visiting many of the places of interest in the city and in noting the great advances and the modern city that had developed since he was a student in the city.

In company with President French, on Monday afternoon, May 27, he visited the Philadelphia College of Pharmacy from which he was graduated in 1874 and from which he received in 1903 the honorary degree of Master in Pharmacy. The board of trutees of the College were in session at the time, considering the report of the Committee on Examinations and the Faculty as to the results of the recent examinations for diplomas to be conferred at the coming commencement.

Mr. Wellcome expressed to the board his gratification and appreciation of the successful and progressive work carried on so consistently by the College and his sense of indebtedness to his old teachers whose instruction had laid the foundation for his business career. He stated that when in Washington recently he was pleased to note the thoroughness of the scientific preparations of the Medical Department of the War Office; the elegant and compact mobile operating rooms and bacteriologic laboratories were cited as examples of the up-to-date methods of surgical and sanitary treatment to be employed. He predicted that in this war medicine and pharmacy would both have great responsibilities and that they would ably discharge their full duty and that pharmacy would ultimately receive the recognition which it deserved as a branch of modern medicine. He felicitated the Philadelphia College of Pharmacy upon the work and stand that it had taken and his confidence in the aid and support which it as an American institution and its graduates will be enabled to give to the government in the present world struggle for human liberty.

MAJOR COSSAR VISITS AMERICA.—In his trip around the world in the interest of the supply department of the Australian Medical Corps and to report on the condition of the pharmaceutical service for the Australian troops abroad and also on the conditions of pharmaceutical service in the armies of the allies, Senior-Major D. A. Cossar, ranking staff officer of the pharmaceutical service in the

Australian army, paid a visit to the United States and to Canada. He contracted both in the provinces and in the United States for needed medical supplies and arranged for their transportation.

At the outbreak of the war, Major Cossar was president of the Pharmaceutical Society of Australasia and conducted a pharmacy near Melbourne. Since his appointment as a pharmaceutical adviser, with the rank of captain, he has done much for the organization of a proper pharmaceutical service in the Australian army. His noteworthy services, exemplary for efficiency both in the saving of materials and men and for the economic management of medical supplies, have attracted the attention of the English-speaking nations. These are said to have had a telling effect in England and it is expected that in the very near future England will realize the necessity for reforms in the medical and pharmaceutical service of her armies.

Major Cossar has left Canada and via Vancouver is on his homeward journey.

PHARMACY STUDENTS SELL LIBERTY BONDS.—Liberty day being a general holiday, even for pharmacy students, the undergraduates of the Philadelphia College of Pharmacy inaugurated a Liberty Loan drive. Professor Louis Gershenfeld marshalled the forces and stimulated the efforts by offering to the student bringing in the largest total subscriptions a year's membership in the American Pharmaceutical Association. This prize was won by William L. Friedman, a junior student who reported subscriptions amounting to $3,500. The total subscriptions from this half-day effort amounted to over $12,000 with 206 subscribers. Thus these younger pharmacists are giving support and encouragement to their comrades who in increasing numbers are enrolling under the flag.

EDITOR CRAIG SEVERS CONNECTION WITH THE N. A. R. D. JOURNAL.—Mr. Hugh Craig, who has, for some years past, inspired with his pen the membership of the National Association of Retail Druggists, has retired from the editorship of that association. We wish Mr. Craig a full measure of success in his new connection with the Nyal Combination of Detroit.

W. W. SOLLIDAY ASSOCIATED WITH MCKESSON AND ROBBINS.—Mr. W. W. Solliday, a graduate of the Philadelphia College of

Pharmacy and who was initiated into the art of the apothecary in an Easton, Pa., pharmacy, has become the sales manager of the pharmaceutical and specialty department of McKesson and Robbins, of New York. Since his graduation from College, Mr. Solliday has had unusual opportunities with several large commercial interests in Philadelphia and New York and the experience and knowledge thus gained coupled with his ability will doubtless enable him to fulfill his greater expectations.

PROFESSOR THOMAS FRAZER RESIGNS.—Sir Thomas Frazer, M.D., has resigned the chair of materia medica at the Edinburgh University. Dr. Frazer was a member of the committee that prepared the latest revision of the British Pharmacopœia.

BURROUGHS WELLCOME & CO. HONOR FAITHFUL EMPLOYEES.—In recognition of faithful service extending over a period of twenty-one years, Burroughs Wellcome & Co. recently presented watches to the following of their employees: Mr. Albert A. Venables, of the home order department; Miss Maud A. Hollis, Wellcome Chemical Works, and Mr. Archibald C. Lodge, Wellcome Chemical Works.

JOSEPH JACOBS AS AN EDITORIAL WRITER.—Pharmacist Jos. Jacobs, of Atlanta, Georgia, has added another "bit for the cause" in two editorials appearing in recent issues of the *Atlanta Constitution.* The one on "Pharmacists in the Army" is an able appeal for better pharmaceutical service in the Army and the enactment of the Edmonds' bill.

The other on "Everyday Patriotism Needed in Winning War" is a well-worded "Americanism" meriting reproduction:

> There is the making of a true patriot in every man, even though he may never see a uniform or attend a flag raising.
>
> The real patriotism consists in doing your work well—giving the best service that is in you—giving it with a wide-open heart, with the thought that all you can have, all you can hope to have, you can give to your country's call.
>
> This should be the platform, the creed, of patriotic business. We can serve our country best by doing our level best in whatever line of endeavor we have undertaken. Honest success, wherever achieved, is patriotic, provided there is back of it a willingness, a purpose, to give whatever is needful to be given to the country's service.
>
> So it is not always the man in uniform; not always the man leading the charge; not always the man plugging the U-boats, who has a monopoly on patriotism.

These men have offered their lives, their all, that their country may be preserved from the foot, or even from the attempt, of the invader. They can give no more.

But back of these men—an essential complement to them—are the patriots of peace, or, rather, of peaceful endeavors—the builders and the workers—the hewers of wood and the drawers of water.

And no matter how humble in rank, each is a patriot who does his duty as he finds it, does it well, and stands prepared to give what he has, in service or in wealth—perhaps in both—to the safety of the nation.

Giving, of course, presupposes the ability to give. To give we must have or we must earn. And none should cease to earn, through service, as long as he is endowed with the earning power.

Only in this way can we meet our country's call. Only as we earn can we pay the taxes it demands, buy Liberty bonds, war savings certificates and do our duty by the varied activities which strengthen and lighten the burdens of the men who are fighting for us.

We can not all fight in the trenches. But if we do our duty—our level best—here at home, we have supported the man in the trenches and made it possible for him to fight a better fight. We have stood with him; we have held him up.

That's our fight, and it may be just as patriotic, just as courageous, as if we fought it with machine gun or bayonet.

It is, if we make it so.

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JOURNAL OF PHARMACY

JULY, 1918

EDITORIAL.

THE STORY OF THE VITAMINES.

In the present issue of the JOURNAL there is presented a number of the more recent contributions to scientific literature on the subject of the "*sitacoids*" or "*vitamines*." The necessity of presenting, to our readers, as fully as possible, the important scientific advances and the influence which the development of this subject is destined to exert on medicine and dietetics fully justifies the space devoted to this symposium. While comparatively little is yet known of the chemistry and special action of these unique substances, it is apparent that, as a class, they play a very important rôle in the nourishment and life functions of every living being.

Many of the niceties of nature's laboratories have not yet been fathomed by man and human hypotheses are often vague and at times erroneous. While the information concerning this group of food accessory factors is as yet very indefinite, the investigations so far made into this interesting and inviting field of scientific exploration seem to indicate that a veritable mine is being developed, the importance of which to human welfare can scarcely be estimated.

The desire to please the human palate has led to the elimination of certain normal constituents of food and in such refinements as degermed wheat and polished rice we have eliminated nature's provisions for maintaining the equilibrium of vital functions or for restoring such equilibrium where any derangement has occurred.

The wide distribution of these vitamines in articles of food, both of animal and vegetable origin, indicates their importance to the physiologic well being of the individual. The absence of these from an otherwise satisfactory diet of a mixture of proteins, fats, carbohydrates and inorganic salts, results in a decline in nutritive food value, attended necessarily by debility and the individual becomes more liable to disease because of the diminished power of resistance. At present, our knowledge is sufficient, at least, to justify the opinion that the vitamines play an important rôle in sustaining normal functions of the human organs and in enabling these to ward off disease. To their absence in the food, or presence in insufficient amount is attributed some well-recognized maladies.

The discovery of the fact that the antiscorbutic vitamine is generated in the living cells of germinating legumes, not only foretells the possibility for advances in the methods of treatment of this affection but also predicts the line of investigation necessary in order to differentiate between the actions of the various sitacoids and their ultimate isolation and study. Probably one of the most important lines for these investigations to follow will be the distinguishing between those vitamines which stimulate the development of pathologic bacteria and those which are benign to human welfare.

The collection of data and the information already available and the character of the investigators engaged in this special field of study, presages the development of a knowledge that will be of the utmost value and service in solving many problems of health and of food values which, at the present time especially, are of paramount importance.

G. M. B.

THE DRUG TRADE AS A FACTOR IN RECONSTRUCTION, AND THE REHABILITATION OF THE WAR VETERAN.

The drug trade interests of the country have doubtless felt the demoralizing effects of the world war quite as much as most of the other industries of the country and after the termination of this titanic struggle, these interests will have their special problems of readjustment and reconstruction to contend with. It is none too early for the loyal citizens and business men of the United States to give earnest thought to the various national problems which we know will arise as a result of this war and the general policies which must be adopted in commercial circles. In these general problems of the post-bellum period of reconstruction, the drug and chemical trades will undoubtedly be an important factor and we can predict that they will assume their full share of the national responsibility in these matters and faithfully discharge their full measure of obligation.

It is not too early now for the drug trade interests to look forward to the period of reconstruction and to arrange in anticipation for the services which they will be able to render as patriotic citizens and also to consider the lines of constructive operations that will redound with the greatest benefits to the special branches of commerce with which they are concerned.

The timely paper by Mr. Douglas C. McMurtrie published in this number of the JOURNAL presents plainly and forcefully to our readers an important war problem that necessarily must receive the early consideration of the loyal commercial interests as well as of the federal authorities. In the very near future we will have many returned warriors who, by reason of wounds or disease contracted in the army, will be incapacitated for military service.

The reëstablishment of these in useful employments in civil life will soon be an imminent problem. The rehabilitation of the crippled soldier as a producing factor able to contribute something toward the assets of the nation rather than to permit of his becoming a public burden, a national liability, will require in many cases a careful consideration and a wise adjustment of the concomitant conditions. Profuse sympathy or open-hearted and open-handed charity will not solve the problem. The development of the spirit of self reliance, the inculcation of the principles that lead to moral, mental and physical independence will be far more essential. The influence of example, the cheering assistance of the "Big Brother" toward a fresh upward start in life is going to be the potent force.

We foresee that the drug trade will be able to provide very many avenues for the employment of worthy veterans in accordance with their individual ability, prior education or adaptability to reëducation to new vocations. Very few of the industries open such a variety of opportunities for the employment, even of crippled soldiers, as do the various branches of the drug trade. Not only can places be found for many whose age and education will permit them to equip for a future career as pharmacists, chemists and laboratory assistants, but there are numberless avenues open in our drug trade industries for the employment of less highly specialized men. Among the possibilities in the wholesale, and manufacturing branches, for the employment of such crippled soldiers we may mention the need for watchmen, porters, order fillers, checkers, packers, shipping clerks, stock keepers, entry and bill clerks, salesmen, accountants and office assistants in various capacities.

Our industries that have had their forces depleted by enlistments and drafts may be thus able to find, in part, the assistance so greatly needed in their own business reconstruction and at the same time aid in making the crippled soldiers self-supporting, self-reliant and in developing many of these into a higher class of citizenship. We predict that the drug trade interests will not be found wanting in accepting as a patriotic duty a full share of the national obligations to our returning soldiers and that such service will not be incompatible with the cold, stern realities of the business world but will redound with benefit to all of those directly concerned.

G. M. B.

THE ROMANCE OF THE CHEMICAL ELEMENTS.

Their History and Etymology.

By Ingo W. D. Hackh, A.B.,
College of Physicians and Surgeons, San Francisco, Cal.

Revolution is everywhere. Our views and opinions are slowly and steadily undergoing a change, not only in political and social ideas, but also in our conception of the material world surrounding us. In many fields of human activities we are progressing rapidly; though some pessimists may predict a dark future for mankind, there is enough evidence of our progress. Philosophers ask often if we are progressing in the right direction, and if we become better people by travelling faster and living more comfortable than ever before? It seems to me that we are, for our social conditions become better, though there is still much reforming to do. For a student of history there is no doubt that our road lies toward a really democratic state of coöperation. At present the world war is paramount in our interests, and we all feel, or should feel, that our brothers in Europe are fighting and dying for the progress of mankind. There will result a better world when the power of autocracy is diminished.

But aside from the mighty changes impending in world politics, there is in the peaceful fields of science a great revolution of ideas.

TABLE I.

The Atomic "Numbers" and the Periodic System of the Chemical Elements.

⑤	58 Ce	59 Pr	60 Nd	61	62 Sa	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm′	70 Tm″	71 Yb	72 Lu	⑤
	50 Sn	51 Sb	52 Te	53 I	54 Xe	55 Cs	56 Ba	57 La	58 Ce							
	32 Ge	33 As	34 Se	35 Br	36 Kr	37 Rb	38 Sr	39 Y	40 Zr							
②	14 Si	15 P	16 S	17 Cl	① 18 Ar	19 K	20 Ca	21 Sc	22 Ti							③
	6 C	7 N	8 O	9 F	10 Ne	11 Na	12 Mg	13 Al	14 Si							
				1 H	2 He	3 Li	4 Be	5 B	6 C							
	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge					
④	40 Zr	41 Cb	42 Mo	43	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn					④
	72 Lu	73 Ta	74 W	75	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb					
⑥	82 Pb	83 Bi	84 Po	85		86 Nt		87	88 Ra	89 Ac	90 Th					⑥
	90 Th	91 Bv	92 U													

This table shows the atomic number and the symbols of the elements. There are in section

① the *noble gases,* electropotential 0, forming no compounds,
② the *nonmetals,* strong electro-negative, forming acids,
③ the *light metals,* strong electro-positive, forming bases,
④ the *heavy metals,* electro-negative and -positive,
⑤ the *rare earth metals,* weak electro-positive,
⑥ the *radio-active elements,* weak electropotential.

The first and last column contains the elements of the carbon family, which are enumerated twice, for they form the connecting links or transitions between the different sections. Many relationships exist between these sections and elements, which are embodied in the so-called *periodic system.* Not yet discovered elements are those indicated by Nos. 43, 61, 75, 85 and 87.

So often in the past experiences of mankind have theories been created and abolished, that it seems to many an observer simply a repetition of the old process. Yet it is more than that.

I need not go into the details of the history of the conception of an element, for the readers will all be familiar with the changing ideas concerning it. But I want to point out one great difference in the standpoint of modern science as compared with the Greek philosophers. Since the introduction of experimental research, mankind has been enabled to accumulate a great deal of facts, which the ancients did not possess. Every discovery of to-day, every technical achievement of to-day, in fact every new invention is built upon the experiences of our forefathers. There is causality in the material world.

With regard to the chemical elements we have now collected and accumulated enough data to enable us to say that there are 92 chemical elements, of which 5 have not yet been discovered. From the results of modern researches on the X-ray spectra of the elements we are justified in ascribing an "atomic number" to each element. This number indicates simply the relative position of the spectral lines for each element. But this number increases strictly in accordance with the atomic weight. Table I gives the atomic number for each element and shows at the same time a modified arrangement of the periodic system.

Our series of elements begins with hydrogen No. 1, and ends with uranium No. 92, and we must assume that under the present cosmical condition upon our earth no more elements can exist. For an atom of uranium has become already so unstable that it decomposes and gives rise to a series of radioactive substances. And, though there are some indications of elements lighter than hydrogen in the sun corona and star nebula, we have every reason to believe that elements lighter than hydrogen do not exist upon our earth. Thus we have our system of elements limited to 92, of which the last 12, that is from No. 80 on, form the series of radioactive elements, whose atoms are so unstable that they disintegrate and break apart, forming elements of lower atomic weight, and also producing the so-called "isotopes." For accuracy's sake I have given in Table II the disintegration series of uranium, thorium and actinium, from which the isotopes for each of the radioactive elements can be seen in the vertical column.

MISSING ELEMENTS.

The five missing elements are those with atomic number 43, 61, 75, 85 and 87. Of these the element 61 belongs to the rare earths, as seen from the periodic table in Table I, Nos. 43 and 75 are ele-

TABLE II.

The Radio-Active Elements. (Sect. 6 of Table I.)

Group	3B	4	5A	6A	7A	0	1A	2A	3A	4	5B	6B
Number Symbol At. W.	81 Tl 204.0	82 Pb 207.2	83 Bi 208.0	84 Po 210	85	86 Nt 222.2	87	88 Ra 226.2	89 Ac ?	90 Th 232.2	91 Bv 234.2	92 U 238.4
		PbRa 206	←	RaF 210								
			RaE 210	↗								
		PbTh 208 PbAc ? RaD 210	↗ ←	ThC′ 212 AcC′ ? RaC′ 214			←	ThX 224 AcX ? Ra 226	←	RaTh 228 RaAc ? Io 230	←	U 234
	ThD 208 AcD ? RaC″ 210	←	ThC 212 AcC ? RaC 214	↗				MsT′ 228	MsT″ 228 Ac ? ↗ ←	← Th 232	Uz ? Ux″ 234	↗
		ThB 212 AcB ? RaB 214	↗ ←	ThA 216 AcA ? RaA 218	←	↓ ThEm 220 AcEm ? RaEm 222				Uy ? Ux′ 234	↗ ←	U 238
No. of isotopes	4	7	4	7	0	3	0	4	2	6	2	2

The distintegration or breaking up of the radioactive substances is indicated by the arrows. Thus:

← (horizontal arrow) indicates the loss of a helium atom (alpha-radiation), the element becomes more electro-positive and the atomic weight decreases by 4.

↗ (inclined arrow) indicates the loss of an electron (beta-radiation), the element becomes more electro-negative and the atomic weight remains the same.

The atomic weight of the actinium series is uncertain, also its origin, but probably it branches off from U through Uy and Uz. It will be noticed that the disintegration from RaTh, RaAc and Io on follows for all three series in the same order, with the exception that at the end RaD breaks further up into RaE then RaF then PbRa.

ments of the manganese group with atomic weights of about 98 and 187, and properties which are between those of the chromium and platinum group. The last two elements, Nos. 85 and 87, belong to the radioactive substances, and there is the theoretical possibility that, owing to their great electropotential, they are not able to exist. That is to say, the periodic system requires, *e. g.,* the element No. 87 to be the most electro-positive element, more electro-positive than cæsium, and at the same time unstable, that is, radioactive. It is very possible that such an element has so short a life, like brevium, that it can practically not exist.

NAMES OF THE ELEMENTS.

Let us return to the known elements. When one looks over the list of pretty names, one naturally wonders how they came about. And indeed some of them have a very interesting story. States and planets, colors and mineral names are represented. We have, *e. g.,* Europe in europium, France in gallium, Norway in thulium, America in columbium, Russia in ruthenium, Germany in germanium, Scandinavia in scandium, Poland in polonium, Cyprus in copper. From our solar system we have represented the sun in helium, earth in tellurium, moon in selenium, mercury in mercury, uranus in uranium, and the little planets or asteroids are also represented: Ceres in cerium, Pallas in palladium. The mythologies of various nations have been ransacked and furnish us iridium from Iris, niobium from Niobe, tantalum from Tantalus of the Greek mythology, while thorium from Thor, vanadium from Vanades are taken from the Scandinavian mythology.

The city of Paris is represented in lutecium, while the Scottish village Strontian is honored in strontium and the town of Ytterby in Sweden has the unique distinction of having four elements named after it, namely ytterbium, yttrium, terbium, erbium.

According to their color several elements have been named from the Greek or Latin terms: color—chromium; white—silver; yellow—chlorine; green—thallium and praseodymium; blue—cæsium and indium; purple—iodine; red—rhodium and rubidium. Many other properties have played a rôle in giving a name to an element, as shown in Table III. There is a certain regularity in this apparent disorder of naming. For instance in the time of Lavoisier the elements hydrogen, nitrogen, oxygen were discovered and named by

TABLE III.

Etymology of the Chemical Elements.

Name.	Symbol.	Number.	Etymology.	In Allusion, in Honor of
Actinium	Ac	89	Lat. activus = active	Radioactivity
Aluminum	Al	13	From alumen	Alum
Antimony	Sb	51	Doubtful	
Argentum	Ag	47	Gr. argyros = silver, argos = white	Its luster
Argon	A	18	Gr. argon = lazy, inert	Its inertness
Arsenic	As	33	Gr. arsenikon, from arsen = male	Its use as paint
Aurum	Au	79	Hebr. awr = light fire, Lat. aurora	Its luster
Barium	Ba	56	Gr. barys = heavy	Its weight
Beryllium	Be	4	Gr. beryllos = a green gem: beryl	Occurrence
Bismuth	Bi	83	Arab. wiss majat = easily melting metal	Fusibility
Boron..........	B	5	From borax	Occurrence
Brevium	Bv	91	Lat. brevis = short	Short life
Bromine........	Br	35	Gr. bromos = stench	Odor
Cadmium	Cd	48	Gr. kadmia = calamine	Occurrence
Caesium	Cs	55	Lat. caesius = sky blue	Blue line in spectrum
Calcium	Ca	20	Lat. calix, Gr. chalix = lime	Occurrence
Carbon	C	6	Lat. carbo = coal	Occurrence
Cerium	Ce	58	Lat. Ceres = goddess of agriculture	New discovered planet
Chlorine........	Cl	17	Gr. chloros = yellowish green	Color of gas
Chromium	Cr	24	Gr. chromos = color	Various colors of compounds
Cobalt.........	Co	27	Germ. kobold = goblin	(See text)
Columbium	Cb	41	Columbia = Amercia, columbite	Occurrence
Copper	Cu	29	Gr. Kyprics = Cyprus, Lat. cuprum	Occurrence
Denebium......	De	69	From the star Deneb (in the swan)	
(Didymium)			Gr. didymos = twins (see Nd and Pr)	
Dubhium.......	Db	70	From the star Dubha (Great Bear)	
Dysprosium	Dy	66	Gr. dysporos = difficult	Difficult separation
Erbium	Er	68	Swedish town Ytterby	Occurrence
Europium	Eu	63	Europe	Europe
Ferrum	Fe	26	Lat. ferrum	
Fluorine	Fl	9	Fluorspar	Occurrence
Gadolinium.....	Gd	64	Gadolinite	Occurrence
Gallium........	Ga	31	Lat. Gallia = France	France
Germanium	Ge	32	Lat. Germania = Germany	Germany
Glucinium	Be	4	Gr. glyccs = sweet	Taste of compds.
Gold	Au	79	Doubtful	
Helium.........	He	2	Lat. helios = sun	Discovery in sun chromosphere
Holmium	Ho	67	Swedish geologist G. Holm	
Hydrargyrum...	Hg	80	Gr. hydrargyros = water and silver	"Molten silver"
Hydrogen	H	1	Gr. hydrcs = water, gennao = produce	"Water-producing substance"
Indium	In	49	Lat. indicum = indigo	Color of spectral line
Iodine	I	53	Gr. iodes = violet color	Color of vapor
Iridium	Ir	77	Gr. Iris = rainbow	Color of salt solutions
Iron	Fe	26	Old high German isarn = iron	
Kalium	K	19	Arab. kali = ash (potash)	Occurrence
Krypton	Kr	36	Gr. krypton = hidden, secret	Obscurity

TABLE 3.—*Continued.*

Name.	Symbol.	Number.	Etymology.	In Allusion, in Honor of
Lanthanum	La	57	Gr. lanthanon = concealed	Obscurity
Lead	Pb	82	Doubtful	
Lithium	Li	3	Gr. lithos = stone	Occurrence
Lutecium	Lu	72	Lat. Lutetia = Paris	City of Paris
Magnesium	Mg	12	Magnesite, from city of Magnesia	Occurrence
Manganese	Mn	25	Gr. manganidso = purify	Use in glass manufacturing
Mercury	Hg	80	Lat. Mercurius = messenger god	
Molybdenum	Mo	42	Gr. molybdaina = lead oxide	
Natrium	Na	11	Hebr. nether = carbonate of soda	
Neodymium	Nd	60	Ger. neon = new, didymos = twins	New-didymium
Neon	Ne	10	Gr. neon = new	The new gas
Nickel	Ni	28	Old German nickel = devil	(See text)
Niobium	Cb	41	From Gr. Niobe, daughter of Tantalus	Associated with Tantalum
Nitrogen	N	7	Lat. niter, Gr. gennao = produce	Niter producing substance
Osmium	Os	76	Gr. osme = odor	Smell of its tetroxide
Oxygen	O	8	Gr. oxys = sour, gennao = produce	Acid-producing element
Palladium	Pd	46	From planet Pallas	
Phosphorus	P	15	Gr. phos = light, phero = bring, carry	Light-carrying element
Platinum	Pt	78	Span. platina = diminutive for silver	"Little silver"
Plumbum	Pb	82	Latin plumbum nigrum = lead	
Polonium	Po	84	From Poland	Poland
Potassium	K	19	From potash	Occurrence
Praseodymium	Pr	59	Gr. Prason = leek green and didymium	"Green didym"
Radium	Ra	88	Lat. radio = to shoot rays	Radioactivity
Rhodium	Rh	45	Gr. rodeos = rose red	Color of compounds
Rubidium	Rb	37	Lat. rubeus = ruby red	Color of spectral line
Ruthenium	Ru	44	Lat. Ruthenia = Russia	
Samarium	Sa	62	From samarskite	Occurrence
Scandium	Sc	21	From Scandinavia	Scandinavia
Selenium	Se	34	Gr. selene = moon	Associated with tellurium (earth)
Silicon	Si	14	Lat. silex = flint, silicia	Occurrence
Silver	Ag	47	Doubtful	
Sodium	Na	11	From soda	Occurrence
Stibium	Sb	51	Gr. stibi = antimony sulfide	Occurrence
Stannum	Sn	50	Lat. stagnum, stannum = tin alloy	
Strontium	Sr	38	From strontianite	Occurrence
Sulphur	S	16	Lat. sal = salt, Gr. pyr. = fire	
Tantalum	Ta	73	From Tantalus (tantalize)	Difficult isolation
Tellurium	Te	52	Lat. tellus = earth	
Terbium	Tb	65	From Swedish town Ytterby	Occurrence
Thallium	Tl	81	Gr. thallos = green twig	Green line in spectrum
Thorium	Th	90	North mythology: Thor	
Thulium	Tm	69	Lat. Thule = Norway or Iceland	Norway

TABLE 3.—*Continued.*

Name.	Symbol.	Number.	Etymology.	In Allusion, in Honor of
Tin	Sn	50	Lat. stannum = tin	
Titanium	Ti	22	Gr. Titanes = half gods	
Tungsten	W	74	Swedish tung-sten = heavy stone	Occurrence
Uranium	U	92	Planet Uranus	
Vanadium	V	23	Northern mythology Vanades = Frigg	
Wolfram	W	74	Old Germ. wolfram	Occurrence
Xenon	Xe	54	Gr. xenon = strange, foreign	"The strange element"
Ytterbium	Yb	71	Swedish town Ytterby	Occurrence
Yttrium	Y	39	Swedish town Ytterby	Occurrence
Zinc	Zn	30	Germ. zinke = prong, tine	Crystalline structure
Zirconium	Zr	40	Arab. zargun = a gem stone, zircon	Occurrence

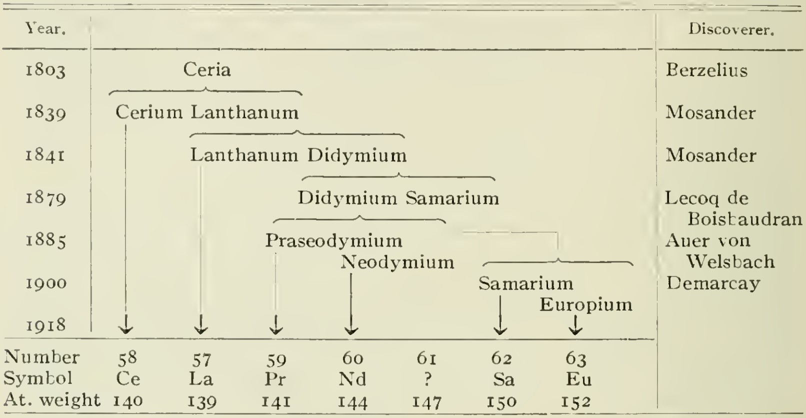
contraction of the respective end products with the Greek gennao—I produce, thus water-producing, niter-producing and acid-producing element. Again many of the rare earth metals have been named after asteroids or other stars, thus cerium, aldebaranium (or ytterbium), cassiopeium (or lutecium), dubhium (or thulium 1), denebium (or thulium 2). Uniform is also the ending for the halogens —chlorine, bromine, iodine; while the metals end generally in -ium, and the metaloxides of the basic metals in -ia.

RARE EARTH METALS.

The rare earth metals have a very complex and confusing history, which is illustrated in their "family tree" in Tables IV and V. The first column gives the year, the last column the name of the discoverer or rather separator, for their properties are so alike that their separation is extremely difficult. Nevertheless there is a limit of their "separability," though some chemists proposed theories that there were no limit. The reason for their great similarity must be found in their atomic structure and the periodic system, for they form a very slow and gradual transition from electro-negative to electro-positive elements, and thus their difference in electropotential is very small. This is just as bridging two rivers of equal width in one case with seven, in the other case with thirty-six pillars. It is clear how the distance of the pillars in these two cases would compare to each other. So we have in the periodic system in one instance between two inert gases seven elements, which differ naturally much more than when there is a period of thirty-six elements, as in the case of the period in which the rare earth metals occur. In the periodic system they form a group from cerium to lutecium, and as pointed out above, their difficult separation was the main cause for such a family tree as Tables IV and V represent.

TABLE IV.

The Family Tree of the Cerit Earths.



Number	58	57	59	60	61	62	63
Symbol	Ce	La	Pr	Nd	?	Sa	Eu
At. weight	140	139	141	144	147	150	152

The platinum metals and the noble gases have a similar history of gradual isolation, as Tables VI and VII show. In the latter the amounts are given and it is easy to understand how such small percentages may be overlooked.

HISTORY OF ELEMENTS.

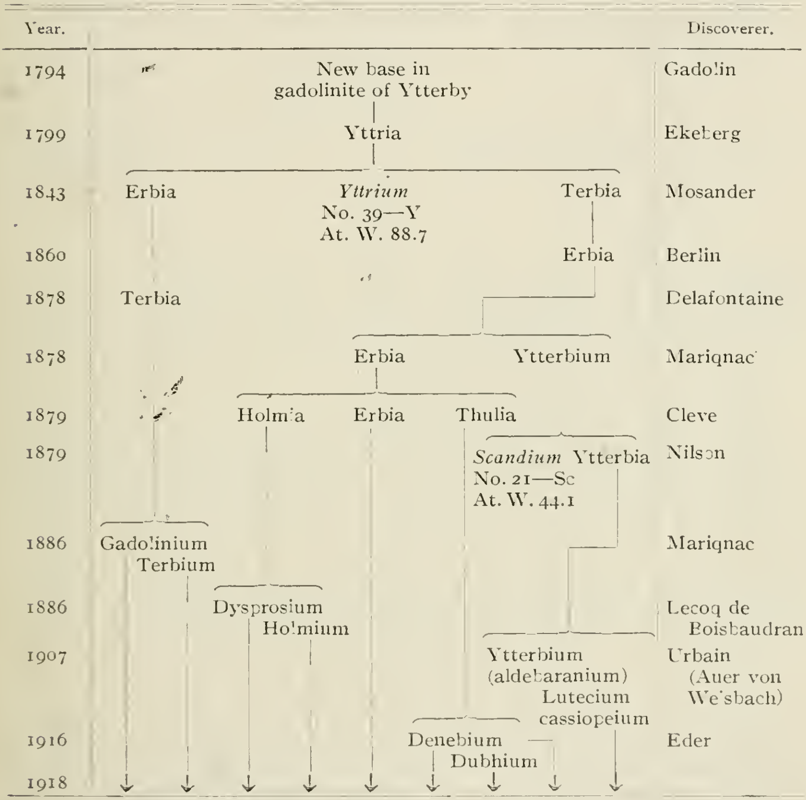
In history the chronological method of tabulating facts has many advantages, and I have followed it here to point out some interesting things connected with the chemical elements. Beginning with elements known to prehistoric man (but naturally not as elements), we will select a few interesting ones.

Carbon.

The discovery of fire was the greatest step toward civilization and anthropologists tell us of the mighty changes which the cooking of food caused in the human features. With fire primitive man became acquainted with *carbon,* the black residue of incomplete combustion. It is interesting to note that in all Teutonic languages the word for coal is derived from the same root "kol," *e. g.*, in German—kohle, Dutch—kool, Danish—kul, Swedish—kol, which indicates

TABLE V.

The Family Tree of the Yttria Earths.

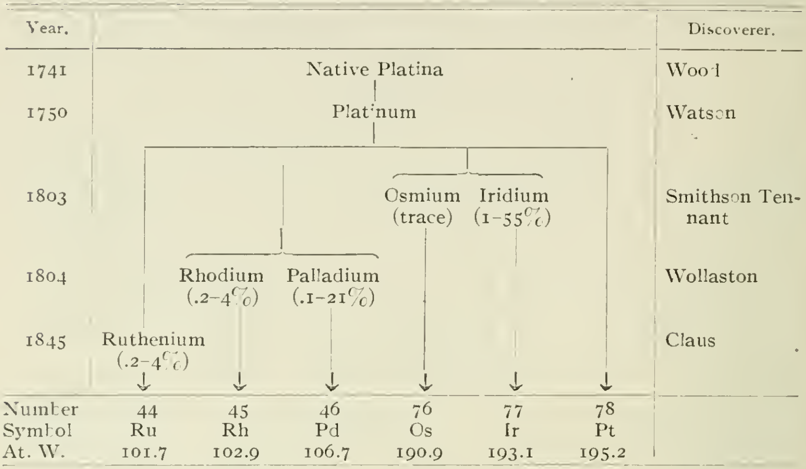


Number	64	65	66	67	68	69	70	71	72
Symbol	Gd	Tb	Dy	Ho	Er	Tl′	Tl″	Yb	Lu
At. W.	157	159	162	164	167	169	170	173	175

that coal was known to the Indogermanic tribes before their prehistoric separation. In Slavic languages we find in Russian—ugoli. In Hebrew we have gehl. The term carbon is derived from the Latin "carbon" = coal, which probably comes from the Greek ἀρφω, arpho = to char, to roast.

TABLE VI.

The Family Tree of the Platinum Metals.



Year.		Discoverer.
1741	Native Platina	Wood
1750	Platinum	Watson
1803	Osmium (trace) Iridium (1–55%)	Smithson Tennant
1804	Rhodium (.2–4%) Palladium (.1–21%)	Wollaston
1845	Ruthenium (.2–4%)	Claus

Number	44	45	46	76	77	78
Symbol	Ru	Rh	Pd	Os	Ir	Pt
At. W.	101.7	102.9	106.7	190.9	193.1	195.2

Sulphur.

The next non-metallic element which primitive man knew was *sulphur,* which occurs as a mineral. Its present name was given to it, however, much later, and indicates its combustible nature. It is a contraction of the Latin sal—salt and Greek πύρ, pyr = fire. Brimstone means "burnstone." In chemical terminology the prefix "thio-" is derived from the Greek θείον, Thion = sulphur.

Gold.

Among the metals *gold* has been known in very remote times. At the dawn of history it was the precious metal for the possession of which wars were fought and great hardships endured. We find it in the oldest Egyptian hieroglyphic inscriptions and in every ancient civilization it was known; *e. g.,* the Egyptians distinguished two kinds of gold: nub-en-mu = river-gold, and nub-en-set = mountain-gold. The first kind was washed from river sand with cloth bags, which, when inverted, formed the picture for the hieroglyph for gold. The first figure gives the older form of the hieroglyph, the second the later form.

To the philologist the name "gold" offers an interesting study in comparing the different languages. The Teutonic languages derive it probably from the Arabic egala = shining, for we have in Swedish and Dutch—guld, German—gold, and even in Finn—kulta. The Romanic languages from the Latin aurum = gold, from aurora

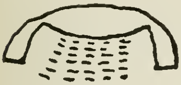


FIG. 1.

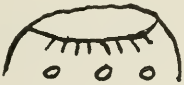


FIG. 2.

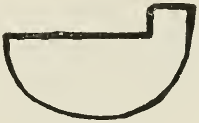


FIG. 3.

and the Hebrew awr = light, fire, *e. g.,* in French—or Italian and Spanish—oro.

Silver.

Another prehistoric metal is *silver,* which occurs more frequent in Assyrian and Egyptian inscriptions, indicating that it was more common than gold. The Latin word argentum is derived from the Greek ἀργυρος, argyros = silver, which in turn comes from ἄργος, argos = gleaming, and is connected with the Sanscrit arj-una = light and raj-ata = white. In the Teutonic languages we have in German—silber, Swedish—silfver, Danish—sölv, Dutch—zilver, the origin of which is doubtful.

Copper.

While gold and silver have always been precious metals and their use by primitive man restricted to ornaments, the first metal to be used in implements was undoubtedly *copper.* In tracing the records of the past by the help of archæological remains we always find a certain order: first the copper age, then the bronze age and last the iron age (the stone age with its several epochs is naturally older). The oldest known civilization is regarded to be the Sumerian, in which we find copper as "urud," which then became "eru" in the following Babylonian civilization. But the earliest record of copper and copper mines dates back to about 4000 B. C., and tells of the copper mines located on Mount Sinai and worked for the Egyptian king Dyezer of the III dynasty, for there were no copper deposits in Egypt. The hieroglyph for copper was the picture of a melting crucible (Fig. 3), which became later the sign for a metal.

Chronologically follows the great Mycenæan civilization on the Island of Cyprus, 3000–1000 B. C., where beautiful copper implements were made. Cyprus became the distributing center of copper for the Greeks and Romans. The Greeks designated it as χαλκός, κύπριος, chalcos cyprios = Cyprian ore, and the Romans as Aes cyprium or simply cuprum. The beginning of the copper age in northern Europe is placed at about 2500 B. C., while in China it came relatively later, in 2200 B. C. It is interesting to note that we have various evidences for the theory that copper came before iron. So, *e. g.*, the Iliad mentions copper 279 times, iron 23 times. The Odyssee, written much later, has 80 times copper and 29 times iron. Iron was at that time more valuable than copper. Another evidence is the fact that the Greek word for smith = χαλκεύς, chalceus, is derived from copper = χαλκός, chalcos, and not from iron = σιδηρος, sideros.

Iron.

Primitive man used always those things which he found and the fact that the oldest implements of *iron* contain a certain amount of nickel is evidence that the iron supply came at first from meteorites, for no iron ore contains nickel, while all the meteorites consist of an alloy of iron and nickel. Iron tools had a very high value, for the metallurgy of iron developed much later. The earliest known iron tool is the one found in the Pyramid of Kephron and dates back to about 3500 B. C., while some iron pieces in the Black Pyramid of Abusir date from about 3000 B. C. Under the Egyptian king Thethmosis III, at about 1500 B. C., the iron metallurgy in Egypt developed among the priests.

The earliest evidence of iron in China dates back to 1900 B. C., in Greece about 1000 B. C., Central Europe 800 B. C., Denmark, Ireland 100 A. D., northern Russia and Siberia 800 A. D., which shows a gradual and slow geographical spread. The making and the tempering of steel is described by Pliny (23–79 A. D.), while the knowledge of cast iron began to develop in the fourteenth century.

The origin of the name iron is not definitely known, but comes probably from the Latin aes = ore, with the ending -arn, thus Indogermanic * isarn, from which the Teutonic languages develop the names. Thus in Gothic—eisam, Anglo-Saxon—isern, old high German—isarn, and in modern German—eisen, Dutch—yser, Swedish

—iärn, Danish—iern. The Latin ferrum = iron may be connected with the Hebrew barzel, as the Romans became acquainted with the metal through the Phœnicians.

Lead.

The first indications of *lead* are in Egyptian and Assyrian inscriptions. The Greeks knew it as μολύβος, molybos, and the Romans as plumbum. In the Old Testament, the Veda, Avesta, and Iliad we find occasional mention of lead. Dioscorides describes lead oxide (litharge) as μολυβδαινα, molybdaina. The Romanic languages derive their term from the Latin plumbum, *e. g.,* in French plomb, in Spanish plomo.

Tin.

The Egyptian did not recognize *tin,* although a copper-tin alloy was known as early as 1600 B. C., and as a constituent of bronze it is of a very ancient use. The Greeks know it as κασσίτερος, kassiteros, and the Romans regarded it as a variety of lead and called it plumbum album. The Latin stannum meant originally a mixture of lead and silver, but in the fourth century tin was designated by it and the modern terms derived, *e. g.,* Spanish—estaño, Portuguese—estanho, Italian—stagno, French—etain, Dutch—tin, Swedish—tenn, German—zinn.

Antimony.

The next metal to become known to the ancients is *antimony,* for it is claimed that already the Chaldæans at about 1000 B. C. understood the preparing of metallic antimony. Its sulphide was well known in the Orient and used as a cosmetic, especially for darkening the eyebrows, the Greeks calling it, στιμμι stimmi, and the Romans stimmi, stibi, or stibium, from which stibium = antimony is derived. There is some doubt as to the origin of the term antimony, which occurs first in the writings of the Alchemist Geber. Some derive it from the Greek αντι, anti, and μοναχος, monachos, meaning "against the monk," the story being that either monks were poisoned with antimony compounds, or that it was used as a remedy against leprosy, a disease occurring frequently among the monks and hermits. Others derive it from the Greek anti and μονος, monos, alone, as the metal which is opposed to being "alone." Still less plausible is the explanation that it is a contraction of Greek anti and Latin minium = red lead, because it was used as a substitute for red lead. The first extensive study of antimony and its compounds was made by an alchemist, Basil Valentin, who wrote the famous treatise, "the Triumphal Chariot of Antimony," which reveals a thorough knowledge of the chemistry of antimony.

Mercury.

Cinnabar, found as a mineral, was well known as a pigment to the ancients, but its constituent *mercury* was unknown to the ancient Jews and early Greek writers. Aristotle and Theophrastus (400–300 B. C.) mention in their writings ὑδράργυρος, hydrargyros, from ὕδωρ, hydor, water, and αργυρος, argyros, silver, being prepared by treating cinnabar with vinegar. The Romans know it as hydrargyrum and argentum vivum = "living silver." The alchemists called it mercurius in allusion to the messenger god Mercurius, who with his winged hat and winged sandals was the conception of speed, and mercury as a liquid metal was very speedy in its escape. Paracelsus (1493–1541) used some of its compounds as a remedy and introduced it thus into medicine, though some of his treatments were fatal to the patients. Solid mercury was for the first time prepared by Braune of Petrograd in 1759.

Arsenic.

Like cinnabar so the sulphide of *arsenic* was well known as orpiment (Latin auripigment = gold color). Aristotle mentions it as σανδάρακη, sandarake, and Theophrastus as ἀρσενικόν, arsenikon, which means "the masculine one." It is derived from αρρηνικόν, = the color for man, and comes from ἄρσην, arsen, male (Zend—arshan), because the old Greek painters used the sulphide as the color for the sunburnt faces of man, women's faces being painted white. Among the alchemists Albertus Magnus (1193–1280) was the first one to prepare metallic arsenic. The term is represented in many old and modern languages, *e. g.*, Arabic—zirnakun, Syriac—zarnika, Spanish, Italian—arsenico, German—arsen, French—arsenic, Hungarian—arzen.

(*To be continued.*)

LOYALTY TO THE COUNTRY AND TO PHARMACY.[1]

BY E. G. EBERLE, PH.M.

In formulating my thoughts, which are to follow the title that was chosen in advance of outlining a promised paper for this Association, I present a timely concordant guide which may carry a message and enable me to draw upon parts of it while complying with my promise:

To respect my country, my profession and myself. To be a loyal citizen, to speak of my country with praise and act always as a trustworthy custodian of its good name. To be loyal to pharmacy and speak of its service with sincerity and conviction that the calling is worthy of my attachment and I a trustworthy votary. To be devoted to the cause of pharmacy, lend my best efforts to its uplift and advancement. To promote association work and thereby promote the service of pharmacy. To be a pharmacist deserving of the respect and confidence of those whom I serve. To look upon its service as an opportunity to be seized with joy and made the most of, and not as a painful drudgery to be reluctantly endured. To believe in pharmacy heart and soul, to be optimistic relative to its mission and convey assurance of its importance to those who are served thereby.

"America's most essential attribute to-day is optimism, because the best interests of the nation demand it. A person who at this juncture is not an optimist is a slacker." May we not in a way apply these optigrams to pharmacy: Pharmacy's most essential attribute to-day is optimism, because the best interests of pharmacy demand it. A pharmacist who at this juncture is not an optimist is a slacker. To be an American to-day means more than it ever did; no matter how different our views may be on other subjects, how diverse our occupations may be, as far as citizenship is concerned there must be a unison of thought and action: To be a pharmacist to-day means more than it ever did. No matter how different our views may be relative to the stock and conduct of the drug store, as far as pharmacy is concerned there must be a unison of thought and action. The diverse interests and activities may be considered in the light of disintegrating forces, and the coöperation of them results in centralizing or unifying them. We have people of every nation in our midst, disseminating their thoughts among us, all of which contribute to our greatness so long as the seed of discord is not sown or the better class of citizenship overwhelmed. One test of citizenship is unquestionable loyalty to the country under all circumstances, and particularly under conditions like the present. The quality of citizenship has a relation to the ideals of citizen. Men's ideal is his closest and highest mental associate—his best friend—for it is most potential in moulding his character, and therefore exercises powerful influence in his success and the quality of service he renders. One must believe in the ideal. One's usefulness to humanity is in proportion to his efforts to reach the ideal.

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[1] Read before the Pennsylvania Pharmaceutical Association at Wilkes-barre, June, 1918.

Coöperation is not an academic theory; it is as sound as that of universal brotherhood. We have not established the latter, nor have we successfully mobilized all the industries. The long-drawn conflict of the world has been between unifying forces and disintegrating forces, just as we have in governments and in every other activity, within and without, and we can trace most of our troubles and hindrances to individualism; coalescence is the solution. Competition does not pay in business except as it applies to service, so in the industries incoördination signifies hindrance. To arrive at the highest efficiency there must be specialization, but a linkage is necessary that coördinates the branches concerned for a common service.

The diverse drug interests in a sense may be viewed in the light of disintegrating forces and the coöperation of them results in centralizing or unifying them. We have druggists with different viewpoints, some inclining to what is denominated commercial and others to that which is termed the professional side of their business. There is no more honorable engagement than the conduct of business on the high plane of honor and integrity, and there is no more dishonorable occupation than to pursue professional lines without sincere regard of the obligations assumed. Whether pharmacy is the profit-yielding part of a drug business or not, the thing is to participate loyally and enthusiastically in the efforts to elevate and conform the commercial and professional status of the calling.

Pharmacy of the drug stores bears a relation to the ideals of the pharmacist; they characterize not only the individual pharmacy but have a powerful influence on pharmacy at large and the service rendered by it. Pharmacy is whatever we make it and represents our belief in it. The layman's estimate of pharmacy is based largely upon that which pharmacists exhibit; they are not in position to render judgment anent what pharmacists may think of pharmacy. All the world may be willing to admit that pharmacy once had an enviable reputation, but most of the world will insist that this reputation not only be maintained but improved. It may be advisable to remind the public of the past record of pharmacy, but they are most concerned with its present status and service. This is our opportunity and our duty.

Insular minds will exert less and less influence for the betterment of pharmacy. The men who count most and whose guidance is of greatest benefit are those who can visualize on pharmacy as an important branch of medical service. And likewise the time will come when medical men will recognize the need of more intensive coöperation with pharmacists. There are some medical men who dislike the word interdependence; they proclaim that they are independent and that their profession is not dependent on pharmacy. This attitude has a relation to the doctrine of individualism, and is incompatible with present-day ideas, when the coöperation of all interests is essential; it breaks the chain that links the branches of medicine for most efficient service.

In the present crisis coöperation means the whole-hearted participation in the purpose of the government to assemble and mobilize the scattered units and resources of the nation, and all loyal citizens patriotically join in these undertakings for its success. And it is in this spirit that we recognize the necessity of the utilization of organized pharmacy as an important factor in the efficiency of the military medical department. Without it the service is incomplete. We do not mean to say that neglect will bring disaster, but surely an established and recognized service is not made use of that would contribute greater safety and more assurance of success in the treatment of the sick and wounded.

In trades and professions coöperation is the means whereby the efforts and resources of individuals engaged in the same or closely related activities may be coördinated for enhanced service and profit and the value thereof is determined by sound judgment and honesty of purpose. The thought is applicable to associated work in pharmacy; we must have our state associations, but these have interests in common that should be represented in the House of Delegates of the American Pharmaceutical Association. The possibilities of such organization for pharmacy have not been fully appreciated, but we do know the great power that has come to the American Medical Association because in its House of Delegates all state medical associations are represented.

The movement for federating the drug industries is also a subject for our earnest consideration. There are common interests in all branches of the drug trade; there are activities that can be developed and great benefits to be derived by coördination and coöperation.

Coöperation is an essential of loyalty, not only an obligation to our country but also to the activities in which we are engaged.

By mutual action and by mutual aid
Great deeds are done—associations made.
The wise new backbone in the wise inspire,
And one hard worker fans another's fire.

WANTED—THE OLD-FASHIONED PHARMACIST.[1]

By J. W. England, Ph.M.

Under the caption of "Wanted—The Old-Fashioned Doctor," the following editorial has recently appeared in the *Philadelphia Public Ledger:*

> As the shortage of doctors continues to make itself manifest in civilian life it is being made clear to the most thoughtless that what the medical schools should turn out in greater numbers and what the country needs is the good, old-fashioned, all-around general practitioner. In many ways the tendency of medical education of recent years toward concentration in the matter of schools and extreme specialization and standardization has not only reduced the number of doctors as a whole, but seriously cut down those who cared for or were trained for general practice. It is now seen this practice was not altogether the wisest of courses. The highest of standards for admission to medical schools, it may be said, should be maintained in these days of advanced sanitation and advanced methods of preventive medicine; but with these high standards, which have had the effect of cutting down the supply of students and therefore of doctors, it would seem as if something should have been done before the war to increase the attractiveness of the

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[1] Presented at annual meeting of Pennsylvania Pharmaceutical Association, Wilkesbarre, June, 1918.

medical profession, and, what is more, instead of forcing the issue as to specialists give the general practitioner a dignity and opportunity which for a number of years have been denied him.

As a consequence, the depletion of the specialists, not only the surgical specialists, by the war, has left the medical profession available in civil life scant in numbers and with altogether too few who are indisputably general practitioners and truly understand the "art of healing." For healing is an art, and it depends more largely than many think on individual equation plus the science of medicine as it is obtained in the schools, the hospitals and the daily practice. . . . As it is, if the war continues, the great need of utilizing the general practitioner for all sorts of service from which he is now cut off by the detailed specialization which rules will be pressed home on every one.

The medical educators, however, naturally are not blind to the situation and to some of them what is happening will be viewed as a case of "I told you so." At all events, as all schools and colleges are looking to their methods with a view of determining their practical relation to the output, it would seem as if the medical schools are in need of some genius who will plan for them a system which will turn out more old-fashioned doctors and leave the necessary specialization carried on by relatively small groups of laboratory workers, while the doctors serve the community as a whole and along broad and general lines, applying the hospital and laboratory facts by the bedside, in the home and in the office as occasion calls for.

The shortage of the "good, old-fashioned, all-around general practitioner" is not only quantitative, by reason of fewer medical schools and fewer students, but qualitative, also, by reason of the extreme standardization of the medical sciences and art taught in the schools and the overspecialization of medical practice.

The practice of medicine today is in a state of evolution. The older practitioner has a firm faith in the use of drugs for the treatment of disease. The newer practitioner has little faith in drugs and much concerning preventive medicine.

The scientific exactness of the sciences applied in preventive medicine—bacteriology, immunology, hygiene, sanitation, etc., and the brilliant results they have yielded in conserving human life, have appealed powerfully to the imagination of the medical profession, especially when contrasted with the apparent lack of scientific precision in the use of drugs, which lack, by the way, is more apparent than real.

Many of the medical schools unduly emphasize the importance of preventive medicine and minimize the importance of materia medica and therapeutics, so that therapeutic nihilism has grown apace and drugs are being used, less and less, by the younger men, at least, in the treatment of disease; although it is but fair to add that some of the most prominent schools and teachers of the day recognize the value of drugs and are staunch advocates of their use.

The indirect result of this trend, however, has been that there is less and less demand by physicians of pharmacists for professional services; and yet many physicians condemn pharmacists for the too largely non-professional character of pharmacy. If the practice of pharmacy in the retail drug store of today is not as professional as it should be, the fault is chiefly with the medical profession by reason of its neglect of materia medica and therapeutics, although the pharmaceutical profession itself is by no means blameless.

As usual, in medical history, the pendulum has swung from one extreme to the other. Formerly, drug-therapeutics was everything in medical practice and preventive medicine a dream; now preventive medicine is everything and drug-therapeutics is nothing, relatively. The truth is, of course, between the two extremes. There is a brilliant future for preventive medicine, but there can be, also, an equally brilliant future for drug-therapeutics. It is most desirable, of course, that every step be taken to prevent disease; but when disease is present, the patient does not care then to know how he got it, or how he can avoid getting it again; what he wants to know is what relief he can get *now*. He is not particularly keen about being "an interesting case" *only* to his physician! He wants something done, being of the opinion of Jacobi, that "those who die, die 100 per cent."

Some one has said that the medical profession has "run after false gods" and "fallen down on its job," that it does not get as successful clinical results as it did when drugs were more generally used (the death rate of pneumonia, for example, twenty-five years ago was 25 per cent.; today it is from 30 to 50 per cent.) and that in consequence, the confidence of the public in physicians has become so weakened that osteopathy, Christian Science, and patent medicines particularly, have obtained their present widespread vogue.

But, whether this is true or not, the fact remains that thousands of years of clinical experience have shown that drugs, rightly used, have real possibilities of usefulness in clinical conditions. It may be that the results gotten cannot always be explained with modern scientific exactitude—the individual drug-reaction in the treatment of disease may be too variable to do so—but this does not justify the neglect of materia medica and drug-therapeutics shown by many of the medical profession in recent years.

Drugs have positive clinical values, and these should be as accurately determined as possible to the end that the wheat may be separated from the chaff and utilized for the benefit of sick humanity. If empirical therapeutics is anathema from a scientific viewpoint why not develop rational therapeutics, as advocated years ago by Dr. Horatio C. Wood, the ablest therapeutist American medicine has ever produced?

The old-fashioned doctor with his intimate knowledge of the possibilities and limitations of drugs in the treatment of disease is being superseded by the new-fashioned doctor who thinks chiefly in terms of preventive medicine; and unless the medical profession awakens to the very serious dangers that menace it through its neglect of materia medica and drug-therapeutics, with the consequent insufficiency of clinical results and the weakened confidence of the public, the influence and prestige of the medical profession will be seriously imperilled.

The medical profession needs nothing today so much as to be born again in a new faith in the rational use of drugs for the treatment of disease, both to ensure and promote the growth and development of the science and art of medicine and for the better preservation of the health and lives of the people.

And when this is done, then the old-fashioned pharmacy and the old-fashioned pharmacist will again come into their own. God speed the day!

ZINC OXIDE, U. S. P.

By Charles H. LaWall, Ph.M.

Under the title "Lead in Medicinal Zinc Oxide," I contributed a paper to the meeting of the New Jersey State Pharmaceutical Association in 1917, at which time attention was directed to the fact that no U. S. P. zinc oxide was obtainable upon the market and that the blame lay at the pharmacist's door for not refusing to accept the articles labeled "for technical use" supplied on orders for "Zinc Oxide, U. S. P." and for not demanding an article in compliance with the U. S. P. requirements as regards the heavy metal test especially.

Since that time some manufacturers have placed U. S. P. zinc oxide upon the market that complies with the tests in every respect. Hence the relevancy of the title of the present paper.

A statement was made in the former paper that it was difficult to obtain satisfactory results with the U. S. P. heavy metal test when applied to zinc compounds. A number of samples have been examined during the past year and subsequent experience leads to the conclusion that the test for lead in zinc oxide by the present heavy metals test might well be eliminated and replaced by the following:

Add 2 grammes of zinc oxide to 5 mils of distilled water and then add 25 mils of diluted sulphuric acid and heat on the water bath with constant stirring for five minutes. The resulting solution should be colorless and free from opalescence or turbidity (copper and lead).

Add 2 grammes of zinc oxide to 20 mils of distilled water and after stirring well add 5 mils of glacial acetic acid and warm upon the water bath until solution is effected. The addition of 5 drops of potassium chromate T.S. produces no turbidity nor precipitate (lead).

Samples of zinc oxide, U. S. P., found upon the market at the present time will answer both of these tests perfectly and they are much easier to apply and base an opinion upon the results than is the heavy metals test previously referred to.

Considerable correspondence has been carried on with manufacturers of zinc oxide relative to the presence of lead and the amount found. One well-known imported brand which has enjoyed a high reputation for years was found to contain 0.28 per cent. of PbO. The U. S. P. heavy metals test under the most favorable conditions will detect about 0.05 per cent. of PbO. The suggested tests will permit the presence of not more than 0.03 per cent. of PbO and this requirement is being met by several manufacturers at the present time and is a fair requirement under the circumstances and one which should be attained by all manufacturers of zinc oxide.

It may be well to state for the benefit of pharmacists whose products are constantly open to inspection and analysis, with subsequent prosecution and unpleasant publicity when articles are found below the U. S. P. standards, that the tests above described may be easily applied to the zinc oxide separated from the official ointment of zinc oxide. I would suggest, therefore, also that to the text for the latter the following paragraph be added:

The residue from the ignition of 10 grammes of ointment of zinc oxide should comply with the requirements for absence of lead (see zinc oxide).

THE DUTY OF THE EMPLOYER IN THE RECONSTRUCTION OF THE CRIPPLED SOLDIER.

By Douglas C. McMurtrie, Director Red Cross Institute for Crippled and Disabled Men, New York City.

We must count on the return from the front of thousands of crippled soldiers. We must plan to give them on their return the best possible chance for the future.

Dependence cannot be placed on monetary compensation in the form of a pension, for in the past the pension system has proved a distinct failure in so far as constructive ends are involved. The pension has never been enough to support in decency the average disabled soldier, but it has been just large enough to act as an incentive to idleness and semi-dependence on relatives or friends.

The only compensation of real value for physical disability is rehabilitation for self-support. Make a man again capable of earning his own living and the chief burden of his handicap drops away. Occupation is, further, the only means for making him happy and contented.

Soon after the outbreak of hostilities the European countries began the establishment of vocational training schools for the rehabilitation of disabled soldiers. They had both the humanitarian aim of restoring crippled men to the greatest possible degree and the economic aim of sparing the community the burden of unproductivity on the part of thousands of its best citizens. The movement had its inception with Mayor Édouard Herriot, of the city of Lyons, France, who found it difficult to reconcile the desperate need for labor in the factories and munition works while men who had lost an arm or a leg, but were otherwise strong and well, were idling their time in the public squares. He therefore induced the municipal council to open an industrial school for war cripples, which has proved the example and inspiration for hundreds of similar schools since founded throughout France, Italy, Germany, Great Britain, and Canada.

The disability of some crippled soldiers is no bar to returning to their former trade, but the injuries of many disqualify them from pursuing again their past occupation. The schools of training prepare these men for some work in which their physical handicap will not materially interfere with their production.

The education of the adult is made up largely of his working experience. The groundwork of training in his past occupation must under no circumstances be abandoned. The new trade must be related to the former one or be, perhaps, an extension or specialization of it. For example, a man who had done manual work in the building trades may, by instruction in architectural drafting and the interpretation of plans, be fitted for a foreman's job, in which the lack of an arm would not prove of serious handicap. A trainman who had lost a leg might wisely be prepared as a telegrapher, so that he could go back to railroad work, with the practice of which he is already familiar.

Whatever training is given must be thorough, for an adult cannot be sent out to employment on the same basis as a boy apprentice. He must be adequately prepared for the work he is to undertake.

The one-armed soldier is equipped with working appliances which have supplanted the old familiar artificial limb. The new appliances are designed with a practical aim only in view; they vary according to the trade in which the individual is to engage. For example, the appliance for a machinist would be quite different from that with which a wood turner would be provided. Some appliances have attached to the stump a chuck in which various tools or hooks can interchangeably be held. The wearer uses these devices only while at work; for evenings and holidays he is provided with a "dress arm" which is made in imitation of the lost natural member.

An important factor in the success of reëducational work is an early start, so that the disabled man shall have no chance to go out unemployed into the community. In even a short period of exposure to the sentimental sympathy of family and friends, his "will to work" is so broken down that it becomes difficult again to restore him to a stand of independence and ambition. For this reason, therefore, the plan for his future is made at as early a date as his physical condition admits, and training is actually under way before the patient is out of the hospital.

In the readjustment of the crippled soldier to civilian life, his placement in employment is a matter of the greatest moment. In this field the employer has a very definite responsibility.

But the employer's duty is not entirely obvious. It is, on the contrary, almost diametrically opposite to what one might superficially infer it to be. The duty is not to "take care of," from patriotic motives, a given number of disabled men, finding for them any odd jobs which are available, and putting the ex-soldiers in them without much regard to whether they can earn the wages paid or not.

Yet this method is all too common. A local committee of employers will deliberate about as follows: "Here are a dozen crippled soldiers for whom we must find jobs. Jones, you have a large factory; you should be able to take care of six of them. Brown, can you not find places for four of them in your warehouse? And Smith, you ought to place at least a couple in your store."

Such a procedure cannot have other than pernicious results. In the first years of war the spirit of patriotism runs high, but experience has shown that men placed on this basis alone find themselves out of a job after the war has been over several years or, in fact, after it has been in progress for a considerable period of time.

A second weakness in this method is that a man who is patronized by giving him a charity job comes to expect as a right such semi-gratuitous support. Such a situation breaks down rather than builds up character, and makes the man progressively a weaker rather than a stronger member of the community. We must not do our returned men such injury.

The third difficulty is that such a system does not take into account the man's future. Casual placement means employment either in a make-shift job as watchman or elevator operator such as we should certainly not offer our disabled men except as a last resort—or in a job beyond the man, one in which, on the cold-blooded considerations of product and wages, he cannot hold his own. Jobs of the first type have for the worker a future of monotony and discouragement. Jobs of the second type are frequently disastrous, for in them a man, instead of becoming steadily more competent and building up confidence in himself, stands still as regards improvement and loses confidence every day. When he is dropped or goes to some other employment, the job will have had for him no permanent benefit.

Twelve men sent to twelve jobs may all be seriously misplaced, while the same twelve placed with thought and wisdom and differently assigned to the same twelve jobs may be ideally located. If normal workers require expert and careful placement, crippled candidates for employment require it even more.

The positive aspect of the employer's duty is to find for the disabled man a constructive job which he can hold on the basis of competency alone. In such a job he can be self-respecting, be happy, and look forward to a future. This is the definite patriotic duty. It is not so easy of execution as telling a superintendent to take care of four men, but there is infinitely more satisfaction to the employer in the results, and infinitely greater advantage to the employee. And it is entirely practical, even in dealing with seriously disabled men.

A cripple is only debarred by his disability from performing certain operations. In the operations which he can perform, the disabled man will be just as efficient as his non-handicapped colleague, or more so. In the multiplicity of modern industrial processes it is entirely possible to find jobs not requiring the operations from which any given type of cripples are debarred. For such jobs as they can fill the cripple should be given preference.

Thousands of cripples are now holding important jobs in the industrial world. But they are men of exceptional character and initiative and have, in general, made their way in spite of employers rather than because of them. Too many employers are ready to give the cripple alms, but not willing to expend the thought necessary to place him in a suitable job. This attitude has helped to make many cripples dependent. With our new responsibilities to the men disabled in fighting for us, the point of view must certainly be changed. What some cripples have done, other cripples can do—if only given an even chance.

The industrial cripple should be considered as well as the military cripple, for in these days of national demand for the greatest possible output there should not be left idle any men who can be made into productive workers.

With thoughtful placement effort, many men can be employed directly on the basis of their past experience. With the disabled soldiers who profit by the training facilities the government will provide, the task should be even easier.

This, then, constitutes the charge of patriotic duty upon the employer:

To study the jobs under his jurisdiction to determine what ones might be satisfactorily held by cripples. To give the cripples preference for these jobs. To consider thoughtfully the applications of disabled men for employment, bearing in mind the importance of utilizing to as great an extent as possible labor which would otherwise be unproductive. To do the returned soldier the honor of offering him real employment, rather than proffering him the ignominy of a charity job.

If the employer will do this, it will be a great factor in making the complete elimination of the dependent cripple a real and inspiring possibility.

SOME EXPERIENCES OF A PHARMACIST AS ONE OF THE ENLISTED PERSONNEL OF THE NAVY.

By W. M. Saylor.

I have read the various arguments, published in the May edition of the American Journal of Pharmacy, in favor of establishing a Pharmaceutical Corps in the United States Army.

That the profession of pharmacy receives no consideration and as a profession does not exist in the military services of this country is quite well known, but the reasons for this condition existing are not so well known or at least not easily explained.

Practically every ship in the Navy large enough to carry a crew of say four hundred or five hundred men carries quite a large stock of drugs and among these some of the most toxic drugs known. The dispensary and drug-store rooms may or may not be in charge of a man who has had a pharmaceutical training; though in case a pharmacist is found in the corps, he is usually given "Dispensary" duty.

The pharmaceutical duties of the naval pharmacist (a warrant officer) are only secondary, in case he has any at all, his duty being clerical work.

No special training of any kind, not even a high-school education, is required for entrance into the Hospital Corps of the Navy.

The following are some of the orders I have received on board ship and carried out whenever possible; many times the limited number of drugs in the supply table did not permit me to do so.

1. "Take two smears of each of these men's throats (sometimes four or five men at a time); stain one slide with Loeffler's Methylene Blue, the other by Gram's method and report findings."

2. "Get a specimen of this man's sputum and examine for tubercle bacilli and pneumococci."

Of course the above orders presumed a knowledge of the preparation of the necessary stains as well as a knowledge of the technique of applying them and the ability to examine the finished slide under the microscope.

3. "Examine this specimen of urine for indican."

4. "Examine this specimen of urine chemically for sugar and albumin and microscopically for casts, and report findings."

5. "Here are samples of drinking water, sixteen of them, from the various tanks, and life boats on board: examine them and determine whether or not they are potable."

I was called out at eleven o'clock one night to examine a specimen of drinking water and send a written report to the officer (doctor) of the day. He of course transmitted the report to the commanding officer.

6. "Make a tenth normal volumetric solution of potassium permanganate." This I was unable to do, as none of the necessary standard chemicals for volumetric work were on board the ship, not even a standard sodium carbonate. Then the doctor wanted the solution immediately and it requires some little time for preparation when made according to the ninth revision of the U. S. Pharmacopœia.

Of course all of my work was verified by the doctor, as the work of an enlisted man on subjects of such moment and involving so much scientific knowledge cannot be considered authoritative.

I know of several pharmacists who have enlisted in the Navy and who are doing good work in anything that may come up requiring their professional training.

The following questions now arise:

1. Could just any member of the Hospital Corps have carried out such orders? Certainly not. No doctor in the Navy would ever expect this.

2. Is all such highly necessary work as this always carried out when it presents itself? If so the doctor would have to do it himself unless he could find some one of the hospital corps who was capable of doing it.

I do not wish to say anything reflecting on the men in the hospital corps of the Navy. They are a fine, good-working bunch of men and deserve the rates they hold.

I only wish to suggest that a man who can do the work required in this branch of the Navy and has also had years of both practical and college training in the sciences and arts, which a pharmacist must know, can be of exceptional value to the service.

I have spoken only concerning some of the duties on board ship and at sea. How much greater must be the necessity for trained pharmacists at a naval hospital where dispensing and laboratory and pharmaceutical, chemical, bacteriological and biological work are indispensable.

Pharmacists have been drafted into the national army as privates and are now being called upon to exercise their knowledge, gained by hard study and the expense of a college training. Is not this practically the same as drafting a profession? No other profession has been made to use their knowledge in this manner without some previous consideration in the way of a commission or better pay.

If the pharmacist is capable of doing such work as that mentioned here is he not also capable and worthy of a rank that will make his work authoritative?

VITAMINES.[1]

By Prof. W. Ramsden.

(*Abstract.*)

It has been discovered during the last twenty years that animals as various as pigeons, fowls, rats, pigs, and man, if fed exclusively on polished rice, develop the disease known as beri-beri, characterized by serious changes in the peripheral nerves, and that a water, or 90 per cent. alcohol, extract of the rice-polishings contains a substance of which very minute quantities prevent or cure the disease.

By careful and laborious experiments with rice and other diets it has been shown that this substance is widely spread in the common foodstuffs and that its presence is essential for life. Attempts to isolate it in a pure state in sufficient quantity for chemical investigation have not hitherto been completely successful, but enough has been ascertained to make certain that it is neither a protein, fat, nor carbohydrate, nor indeed any of the known constituents of plants or animals. It is free from phosphorus, insoluble in absolute alcohol, ether, benzene, acetone, or oils, soluble in water or 90 per cent. alcohol, and is adsorbed by fullers' earth or animal charcoal. It survives a good deal of cooking at 100° C., but is slowly destroyed at 120°. It is resistant to 5 per cent. sulphuric acid. Funk has proposed for it the name "the anti-beri-beri vitamine" and this term "vitamine," although open to many objections, has been widely adopted for substances of this type. The name "sitacoid," meaning a medicine-like substance associated with food, is suggested by the writer as accurately descriptive and not implying a knowledge of their chemical characters which we do not possess.

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[1] From the *Journal of the Society of Chemical Industry*, February, 1918.

Most foodstuffs contain adequate amounts of the anti-beri-beri substance but, it is important to note, white flour, polished rice, and arrowroot, and probably also "corn-flour," and much of what is sold as sago, tapioca, and semolina, contain more. Ordinary white bread doubtless contains a little derived from its yeast, but certainly not enough for health unless supplemented by other foodstuffs. Wheat-bran contains a little, wheat-embryo contains a good deal.

It has also been discovered, thanks mainly to the pioneer researches of Hopkins, Stepp, Osborne and Mendel, and McCollum and his collaborators, that rats and mice require not only the anti-beri-beri substance in their diet, but at least one other vitamine or sitacoid, and in its absence get sore eyes (xerophthalmia) and are unable to grow. It will be convenient to refer to this as the anti-sore-eyes substance (McCollum's fat-soluble A).

As found in animal substances, it is slightly soluble in water, but much more so in oils, ether, and hot alcohol. It is very resistant to ordinary cooking operations, but is slowly destroyed by prolonged exposure to daylight. It has not been identified with any of the chemically known constituents of plants or animals. It is either completely free from phosphorus and nitrogen or, alternatively, it is active in incredibly minute amounts. As found in the higher plants it is insoluble in ether, oil, or hot alcohol. The relations between the plant and the animal anti-sore-eyes substances have not yet been ascertained. Proved to be indispensable for mice and rats, and especially for the growth of the young, there are strong reasons also for suspecting it to be equally indispensable for man. It is present in quantity in yolk of egg, codliver oil, all animal fats investigated (with the remarkable exception of lard), milk, cheese, butter, margarine made from animal fats, green leaves, soya beans, millet, and flax seed. It is absent from lard and all vegetable oils (almond, maize, cottonseed, sunflower seed, linseed, and soya bean oils) and margarines made from them. It is present, although apparently in small amount only, in the (entire) seed of wheat, oats, maize, hemp, rye, and cottonseed.

There are strong reasons for believing that lack of yet a third vitamine or sitacoid is mainly responsible for the disease known as scurvy. This anti-scorbutic substance is remarkable in that although surviving ordinary cooking operations it usually fails to survive slow drying or long "preservation" of the food in which it is contained. It is present in all fresh vegetables, fruit, or meat. It is rarely or never present in dried vegetables. It is absent or inadequate in amount in dried seeds, but it is present in seeds, *e. g.*, barley, peas, which have just been allowed to germinate (Furst, Weill and Mouriquand, Miss Chick).

McCollum's observation that guinea pigs on a diet of oats do not get scurvy if given laxatives is explicable on the assumption that the anti-scorbutic substance is essential for the normal functioning of the intestine.

The table given below indicates some of the commoner foods in which one or more of the three vitamines have been definitely proved present or absent. The feeding experiments necessary for each such proof are time-consuming and demand very many precautions. Anything like exact comparisons is at present impossible, and the number of plus signs in the table indicates merely the general impression conveyed by the different observers.

	Anti-Beri-beri.	Anti-Xerophthalmia.	Anti-Scurvy.
Egg-yolk	++++	++++	o
Milk (cow's)[2]	+	++	+
Butter	little or none	++++	o
Whole meal wheat flour	++	little or none	o
White wheat flour	o	little or none	o
Potatoes	+		++
Cabbage	++	+++	+++
Dried peas	++	very little	o
Orange juice			++
Dried soya bean, millet, and linseed	++	++	o
Fresh meat and fish	+	+	+
Tinned meat	o		o
Cod-liver oil	o	+++	o
Lard	o	o	o
Margarine:			
from animal fats	o	++	o
from vegetable fats	o	o	o
Yeast	++++	little	o

[2] Milk vitamine-content depends largely on the mother's diet.

There is evidence that unless a nursing mother is obtaining adequate amounts of the first two vitamines in her food the milk she produces is deficient in these bodies. Adults tolerate lack of these substances in food much longer than young growing animals.

It is clear that the facts of which a brief account has been given above are of much importance to this community, and should be widely known.

THE BEHAVIOR OF CERTAIN VITAMINS.[1]

A recent study of one of the dietary essentials of vitamins which McCollum has designated temporarily as "water-soluble B" brings us appreciably nearer to a more precise understanding of these unique substances. Ever since the surprising descriptions of the almost miraculous relief of animals suffering from experimental polyneuritis by the administration of extremely small quantities of substances derived from rice polishings and other sources, the curiosity of both the physiologist and the clinician has been aroused at the possible chemical nature and mode of action of these so-called vitamins. Enough data furnished by competent workers now exist to indicate how essential these as yet unidentified components of the diet are for the physiologic well-being of the individual. Without certain additions, otherwise adequate mixtures of the familiar nutrients, proteins, fats, carbohydrates and inorganic salts will not suffice to induce satisfactory nutrition. These additions or vitamins, are widely distributed in the most diverse natural products. The absence of the dietary essentials results in nutritive decline, and a variety of pathologic consequences which are just beginning to be recognized as indications of the dietary deficiences. McCollum and Simmonds[2] have found that the water-soluble B, the vitamin that averts symptoms of polyneuritis when the diet is otherwise adequate, can be extracted from diverse plant and animal sources by the use of alcohol. This procedure liberates the vitamin, so that it becomes soluble in organic solvents like benzene, with which it cannot be extracted from its original sources. Thus it has been found that the water-soluble B is not extracted directly from beans, wheat germ, or pig kidney by ether, benzene or acetone but is readily extracted in great part by alcohol. After being removed by alcohol, it is shown to be soluble thereupon in benzene, but very slightly soluble in acetone. The probability, McCollum and Simmonds state, that there should be two or more physiologically indispensable substances in what they term water-soluble B, both or all of which should show the same solubility relations with three solvents, is relatively small and lends support to their view that the substance which protects animals against polyneuritis is the only essential complex in the extracts described. In other words, the data support the view that there are no specific substances present in these extracts which protect against such diseases as scurvy, rickets, pellagra and sprue, and tend to confirm their contention that the latter are not due to specific starvation, as is the case with beriberi and xerophthalmia. The tentative exclusion of the hypothesis of a great multiplicity of vitamins marks an advance in the study of these diseases.

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[1] From the *Journal of the American Medical Association,* April 6, 1918.

[2] McCollum, E. V., and Simmonds, Nina, "A Study of the Dietary Essential, Water-Soluble B, in Relation to its Solubility and Stability Towards Reagents," *Jour. Biol. Chem.,* 1918, 33, 55.

BACTERIA AND VITAMINS.[1]

That the food accessory factors now familiarly spoken of as vitamins may have some part to play in relation to the immunity of the body from disease, or its susceptibility to invasion by microörganisms, is suggested by a variety of known facts. One striking illustration is found in the tendency for the development of xerophthalmia when the fat-soluble vitamin, such as occurs in milk fat or butter, egg yolk and cod-liver oil, is missing from the diet. From recent investigations it seems probable that not only animals, but even the higher plants, may derive advantage for their growth and development from substances comparable with the vitamins that facilitate animal well-being and exert their potency even when extremely small amounts of the as yet unidentified compounds are added to the culture medium. Loeb and Northrop,[2] who have succeeded in cultivating flies in the absence of bacteria, have shown that these lower forms also apparently require some accessory substance to facilitate their development. Now we are told that even bacteria cannot thrive without the presence of factors which act in very small amounts and are not, by themselves, able to support growth. Lloyd,[3] in England, has called attention to the alleged rôle of vitamins in the growth of the meningococcus, concluding from her investigations that the primary cultivation of this microörganism in vitro is possible only in the presence of certain accessory growth factors present in blood, serum, milk and other animal fluids, and probably also in vegetable tissues. She regards the essential substances as moderately stable toward heat. In this country, Davis[4] has offered further evidence that something comparable with vitamin phenomena may appear in bacterial nutrition. His attention has been directed to the growth of hemophilic bacteria which require hemoglobin for their development. For optimal growth, however, something more seems to be essential, and the added factor, not found in synthetic mediums, is found in foreign bacteria, and in fresh animal and plant tissues. How the substances thus furnished act is quite as obscure as is the answer to the question of their chemical nature. Davis suggests that they may function, in the case of hemophilic bacilli, to render iron more available; and he ventures the further suggestion that the action of vitamins in animals and higher plants may concern or somehow control the metabolism of certain elements like iron, phosphorus, calcium or iodine, as well as possibly the protein metabolism. It is perhaps too early in the period of collecting facts in this field of study and critically evaluating them to indulge in elaborate hypotheses; but the fascinating mystery of the vitamins is penetrating into many avenues of biologic inquiry. Science must guard against undue enthusiasm when so much uncertainty and contradiction still exist.

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[1] From the *Journal of the American Medical Association*, April 20, 1918.

[2] Loeb, J., and Northrop, J. H., "Nutrition and Evolution," Second Note, *Jour. Biol. Chem.*, 1916, 27, 309.

THE STABILITY OF VITAMINS.[1]

There is a widespread impression that those as yet little understood, but apparently indispensable, components of the diet popularly termed vitamins are easily destroyed by heat. Obviously the establishment of the truth in this respect is a matter of great importance. Most of the foods that enter the diet of man beyond the period of infancy are subjected to heat in cooking; and at present the practice of food preservation as a part of the conservation movement involves the application of heat. One need only recall the preparation of canned vegetables, tinned meats and milks, and the sterilization of milk by heating, to appreciate a further aspect of the problem.

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[3] Lloyd, Dorothy, *Jour. Path. and Bacteriol.*, 1916, 21, 113.

[4] Davis, D. J., "Food Accessory Factors (Vitamins) in Bacterial Culture, with Especial Reference to Hemophilic Bacilli," I, *Jour. Infect. Dis.*, 1917, 21, 392.

[1] From the *Journal of the American Medical Association,* April 27, 1918

The statements as to the instability of vitamins toward heat seem, to a large extent at least, to be an outcome of the widely held belief that heated milk is responsible for infantile scurvy, which, in turn, is conceived to be a deficiency disease. As we have pointed out in the past, the etiology of scorbutus is far from being definitely understood, and the bearing of the milk factor in the genesis of the symptoms is still open to new interpretations. The most promising method of ascertaining the truth would seem to consist in studying the effect of heat on sources of vitamin that can be tested in unmistakable ways. One of these is afforded by the ready production of experimental avian polyneuritis, the analogue of human beriberi, which is easily relieved by suitable vitamin products. The results and their proper interpretation are usually clear. In this way several American investigators have shown that the boiling temperature of water is by no means entirely destructive to the antineuritic vitamin, even though heating under pressure may be destructive in its effects.

At the Lister Institution in London, Chick and Hume[2] have renewed the study of the fate of vitamins on heating, employing the antineuritic properties of the wheat embryo and of yeast as test objects. They found that exposure of wheat embryo to a temperature of about 100° C. for two hours resulted in no significant loss in antineuritic "vitamin." If, therefore, it is included in the flour from which bread or biscuit is made, it can be relied on to retain its antineuritic properties after baking. At temperatures in the neighborhood of 120° C., however, there was a swift destruction of antineuritic properties. This fact has an important bearing where diets are largely composed of preserved and canned foods previously sterilized at temperature above 100° C.

There is at present a pronounced difference of opinion as to the nature of scurvy. The classic experimental animal for the study of this condition has been the guinea pig. Holst has found that it will develop the disease in acute form if kept on a diet of cereals with water or sterilized milk. McCollum and his associates are unwilling to admit that scurvy belongs to the deficiency diseases in the sense of being caused by a lack of vitamins in the diet. They associate it rather with the absence of suitable texture or bulk to the food so that the intestinal functions are not appropriately exercised. In the forms of scurvy familiar in human experience, fresh fruits and vegetables are believed to have a pronounced curative virtue. Obviously the facts can be adjusted to a variety of hypotheses. It may be assumed that the curative foods mentioned furnish needed vitamins or that they succeed by altering the alimentary functions in a beneficial way. In any event, Holst reported that the antiscorbutic power of certain fresh foods, notably cabbage, was slightly lessened after exposure to 100° C. for half an hour, but that the deterioration was appreciable after one hour; at from 110° to 120° C. the destruction was rapid and complete. If such evidence is accepted, it would seem as if neither the antineuritic vitamin nor the antiscorbutic property, whatever the latter may be, can be expected to survive in canned or sterilized foods that have been subjected to temperature approaching the damaging limits mentioned.

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[2] Chick, Harriette, and Hume, E. Margaret, "The Effect of Exposure to Temperatures at or above 100° C. on the Substance (Vitamin) whose Deficiency in a Diet Causes Polyneuritis in Birds and Beri-Beri in Man," *Proc. Roy. Soc., B,* 1917, 90, 60.

Chick and Hume,[3] who have studied the distribution among foods, especially those suitable for the rationing of armies, of the substances required for the prevention of beriberi and scurvy, respectively, have come to the conclusion, to quote their own words, that "the antiscorbutic vitamin is present in active living vegetable tissues. It is also present in animal tissue, to a much less degree. Fresh vegetables and fresh fruit juices are the most valuable sources of antiscorbutic vitamin that we possess. All the dried foodstuffs examined, including desiccated vegetables, were more or less deficient in this vitamin." These investigators at the Lister Institute in London have further stated that dry legumes and cereals, though rich in antiberiberi vitamin, are deficient in antiscorbutic vitamin, and afford no protection against scurvy. If these are moistened, however, and allowed to germinate, the antiscorbutic principle is regenerated with the beginnings of active cell life. In view of their own experiments and the existing literature on the subject, Chick and Hume believe that in the case of armies or other populations subsisting largely on canned food, it is imperative to provide an adequate supply of vitamin from outside sources. Their dicta are: To prevent beriberi, the bread or biscuit should be made from wholemeal or germ-containing flour. To prevent scurvy, if a supply of fresh fruit or vegetables is not procurable, germinated legumes should be added to the diet.

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[3] Chick, Harriette, and Hume, C. Margaret, "The Distribution among Foodstuffs (Especially Those Suitable for the Rationing of Armies) of the Substances Required for the Prevention of (A) Beriberi and (B) Scurvy," *Tr. Soc. Tr'p. Med. and Hyg.*, 1917, 10, 141.

We may admit the wisdom of giving due consideration to this carefully planned advice without thereby accepting the hypotheses that have been injected into it. It would be folly, we believe, to proclaim any wholesale condemnation of foods preserved with heat as devoid of antiscorbutic properties until far more evidence is available—evidence obtained without the prejudice of a preconceived theory of etiology. The propaganda for conservation of food by drying must not receive a setback until more conclusive proof of an actual deficiency of any vitamins that they may originally have contained is furnished. Nor must the interesting and valuable vitamin theory be allowed to overshadow completely the fact that calories are necessary for nutrition.

VITAMINE CONTENT OF SOME PHILIPPINE VEGETABLES.[1]

By H. C. Brill and C. Alincastre.

No reliable quantitative methods for the estimation of vitamines have been perfected, and it is probable that in the processes used for their isolation some of them are broken up into simpler substances. Funk (*Biochem. J.*, 1913, 7, 211) determined the vitamine content of milk by estimating the nitrogen of the phosphotungstic acid precipitate by the Kjeldahl method, but subsequently Drummond and Funk (*Biochem. J.*, 1914, 8, 598) found that all the nitrogen of vitamine is not obtained by means of this method, since compounds containing the pyridine ring resist the digestion with sulphuric acid, and approximately only three fourths of the nitrogen of such bodies is so obtained. The present authors base their method upon this property of pyridine derivatives, and proceed as follows:

[1] Abstracted from *Phil. J. of Sci.*, 1917, 11, 127–132 through the *Analyst*, April, 1918.

A portion of the fresh vegetables was dried at a low temperature and very finely ground, and 100 Gm. of the ground foodstuff were exhaustively extracted with methyl alcohol. The alcohol was evaporated at low temperature, and the residue was taken up in water and filtered. The filtrate was acidified with sufficient sulphuric acid to make a concentration of 5 per cent. Phosphotungstic acid was added to this solution to precipitate the antineuritic substance. After standing for from four to eight hours the precipitate was filtered off, washed with 5 per cent. sulphuric acid and finally with alcohol, and dried in a desiccator over sulphuric acid. The nitrogen was estimated in this residue by both the Kjeldahl and Dumas methods.

The values thus found for the vitamine content of Philippine vegetables by this method are usually higher than the results found by Funk for milk (0.001 to 0.003 per cent.), and in the tables given results are recorded for both Kjeldahl and Dumas nitrogen values. The agreement between the two is fairly close when the necessary correction is applied to the Kjeldahl method, allowing for the fact that it is approximately 25 per cent. lower than the Dumas method; the vitamine calculated on some twenty different vegetables from approximately 0.002 to 0.04 per cent.

PRODUCT PATENTS.[1]

By K. P. McElroy.

Once in every so often somebody of a guileless turn of mind asks me what a "product patent" is and it rather peeves me, for one can't define the non-existent. There is not, never was, and likely never will be a "product patent," a patent on a product as a product. The law does not authorize any such patent. We who concern ourselves with patents, like other specialists, have an argot of our own, and our words and phrases are not always what they seem. We are much interested in certain legal relationships between a process and its product; and we chatter considerably of product claims, and even of product patents, when we are really talking about claims for a composition or for an article. And the innocent bystander, taking our vocabulary for his own, goes away with the impression that a patent can be had on some disembodied ghost of a "product"; and then he comes around and bothers me with his mental nebulosities.

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[1] *The Journal of Industrial and Engineering Chemistry*, April, 1918.

The statute under which we work says nothing about a product, but it does define as patentable "any new and useful art, machine, manufacture or composition of matter." Four statutory classes are established and anything patentable must be included in one of these four classes. An "art" is a process or method: a way of doing things; and it always results in a product. This product may be a machine or a manufacture or a composition of matter. It is not patentable unless it is one of the three. Conversely, any machine, or any manufacture or any composition of matter is a product; it is a product of some "art." A process may be novel and the product old, as in a new way of making flapjacks; or both the process and the product may be new. In the latter event the process and the product may be, and usually are, the result of the same mental inventive act; but since they are in separate statutory classes they are, legally, different inventions and must be separately patented; either as different claims in the same patent or as claims in separate patents—the product, of course, being claimed as what it is, as a machine or a manufacture or a composition. Being separate inventions, each must stand on its own legs; and the patentability of the one is in no way affected by the patentability of the other. No matter whether the product is a machine, or an article, or a composition, to be patentable it must be novel in and of itself, and irrespective of any novelty in the process by which it is produced. A composition may be a mechanical mixture or a chemical compound; and it may be novel because things are brought together which were never brought together before, or because they are assembled in a new way (as in a coated granule) or because, though old in make-up, the composition is in a new condition or state; because it has some different form, or characteristic, or property. It does not matter wherein the novelty resides as long as the composition is new and useful. But if it is new, then the novelty must be capable of being pointed out in some way; there must be a test or a characteristic which can be utilized to show that the alleged new composition is indeed new; it may be because it is pink, or is soluble in alcohol, or has a particular melting point or almost anything. If there is no test and no characteristic which will differentiate it from an old thing which the public has the right to use, then it is the same as the old thing. As a matter of common sense, if the new thing cannot be differentiated from the old thing then there is no difference. And it cannot be made different by talking about its past history; by reciting differences in the process by which it is made. That particular experiment in patent law was made by the Badische at the time of the alizarine synthesis when it claimed "artificial" alizarine as a new composition. The Supreme Court remarked, in effect (Cochrane *vs.* Badische, 111 U. S. 293), that if the new artificial alizarine was exactly the same thing as the old natural alizarine then it was exactly the same thing and calling it "artificial" did not make it different. Of course, sometimes we have to characterize substances by adjectives which look a little process-y because they happen also to be past preterits of verbs, as in talking of a boiled ham or a fried egg or wrought iron, but this does not militate against the general proposition that a thing to be patentable must be differentiated from old things by stating its properties or its characteristics; and that it must be new in itself and not new because of the process by which it was made, *i. e.,* it is not made novel by being a "product."

I regret to say that the nebulous-minded gentlemen with their misconception of "product patents," instead of merely infesting my office, are getting into print and into Congress. And in this there is a certain danger. Mrs. Malaprop was a very pleasant lady; but it was not safe to entrust any business to her. In the present mood of Congress and the people, a proposition to revise the multiplication table, if backed by a good patriotic showing, might slip through. And these gentry wish to abolish "product patents," feeling in some vague way that this will hurt Germany and help us. I do not see how it will do either; but I am somewhat hampered by my inability to grasp exactly what they mean by a "product patent" anyway. If they mean "product" in its legitimate ordinary sense, then the proposition is an absurdity because it is to abolish all patents save patents on processes. For everything that man can make is a product, and it is a product of a process of making: perhaps a patentable process and perhaps an unpatentable one, but still a process.

However, being something of a mind-reader, albeit my education in this line was somewhat neglected, I surmise that what is actually meant is the abolition of patents on the products of really-and-truly chemical processes. If this be so, it leaves intact two more of our statutory classes since a machine and a manufacture are commonly products of mechanical or physical methods; but it makes the fourth class, the composition of matter, look like the remnants of the shell-shot cathedral at Rheims, with patentability hanging on by an eyelash. It is not abolished—not all of it; just most of it. Some compositions will be patentable and some not—those whose pedigree is in any way tainted with the "chemical." A little chemistry will damn a thing quite as effectually as a great deal since courts will not draw distinctions between much and little, that being purely a "question of degree." The alibi of the guiltless inventor would have to be absolute, and there might be some difficulty of proving it in the absence of any universally accepted definition of "chemical." At present neither I nor anybody else can write an impeccable definition of the word, one which would stand fire in court. I do not even know, for example, whether dissolving sugar in water is a "chemical" process.

Shifting the anathema to "chemical compound" does not help any, since if a chemical compound is something resulting from chemical action (which is as good a definition as any) we come out the same hole we went in, with the additional burden of defining a "compound." In a general way I know what a compound is; we all do. It is a body composed of two or more elements united in definite proportions, which, however, is just as true of type metal as of aniline; or, for that matter, of any good uniform grade of cast iron.

I fear me that any attempt to sort out the chemical goats from the physical sheep in the composition of matter class would prove like the task of hunting polar bears in purgatory—"apt to be arduous in detail and disappointing in result." There are too many hybrids, goatish sheep and sheepish goats. It would be simpler to abolish the whole class at one fell whack. But I do not understand anybody wants to do this. So far as I understand, the chemist is the only chap it is meant to ostracize; and even he may escape if he does not have intelligence to know what is happening when he stews two things together.

Despite the present popularity of class legislation, being a hidebound Republican I do not like it; and as a chemist I object to being the class if the legislation is discriminatory against me. To deprive the chemist of his reward for his labor by taking away his "product" claim (whatever that "product" claim may be) is the same to him as depriving the machinist of his claim to his machine or the weaver to his new article in the way of a fabric. It is not good equity; and moreover it is not good sense. The object of the patent laws is to promote the progress of science and the useful arts, and that they have fulfilled their mission is beyond a peradventure. Why stop now and stop in a single science? For 125 years (to be exact, since February 21, 1793) the chemist has been as much entitled to look forward for reward for what he did as anybody else; he read his title just as clear as did the machinist. Maybe I am biased, and very likely I am, but I can't, for the life of me, see wherein there is any legal or equitable difference between the standing of the chap who puts together an alkyl radical and an aryl radical to make a new drug or a new dye and the man who puts together levers and keys to make a new typewriter. That the product of one is sold in a bottle and the product of the other in a box is not material. Any argument that seeks to discriminate between them is as lopsided as a crane; and I don't like being on the wrong side of the lop. It is at least as much an object to the public to encourage the chemist by patents as it is to encourage the machinist. Both are human and, commonly, poor, and neither is going to strain his ingenuity working nights unless he sees a patent ahead.

Running through all this "product patent" talk, like a rotten streak in a mushy banana, is the idea that the chemist who creates a new drug or dye that becomes a public necessity as soon as its creation and existence are known to the public is guilty of creating public necessities to his own profit, and he ought to be discouraged; or if he won't be, then he should not be allowed to make the profit—which sounds like a curious piece of mental perversion, worthy of the gentleman who habitually stood on his head to peel the apple dumplings; but I am not gilding the lily any in reproducing it—far from it; I am merely condensing and Englishing certain actual arguments which have been made.

WASHINGTON, D. C.,
February 18, 1918.

EXAMINATION OF AMERICAN-MADE ACETYLSALICYLIC ACID.[1]

By Paul Nicholas Leech.

At the request of the Council on Pharmacy and Chemistry, the A. M. A. Chemical Laboratory has undertaken examinations of American-made synthetic drugs. The most extensively used synthetic is acetylsalicylic acid and hence an investigation of this product was deemed expedient.

For seventeen years acetylsalicylic acid was protected by a United States Patent (the proprietors were not give a patent in other countries) and sold under the name "Aspirin." In February, 1917, the patent expired, and since then a number of firms have engaged in the manufacture of acetylsalicylic acid, selling it either as such or as aspirin, modified, of course, by a distinctive firm designation. During this period the former manufacturers (The Bayer Co., New York in past years called Farbenfabriken of Elberfeld Co., New York) have been extensively advertising, both to physicians and the public, the alleged superior qualities of their product. The chemical examination, therefore, was concerned chiefly with tests of purity, and the comparison of the American brands with the formerly patented product.

In European countries, acetylsalicylic acid[2] is described in the various pharmacopœias as a condensation product of acetic anhydride or acetyl chloride with salicylic acid (*o*-hydroxybenzoic acid). Generally the test of identification is hydrolysis of acetylsalicylic acid and qualitative tests for acetic acid and salicylic acid. For purposes of purity the requirements are essentially that the specimen should have a certain melting point, should show absence of salicylic acid by means of ferric chloride (the manipulations for the tests are variously described) and leave no appreciable ash. The two tests of purity most generally employed, however, are the melting point and the reaction with ferric chloride.

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[1] *The Journal of Industrial and Engineering Chemistry*, April, 1918.

[2] Unfortunately, the non-descriptive name "aspirin" has been used extensively in European literature, and has even gotten into European pharmacopœias, instead of the scientific name "acetylsalicylic acid."

Melting Point.—The melting point of acetylsalicylic acid has been given at various temperatures from 118° to 137° C.;[3] the *British Pharmacopœia* describes the melting point at 133° to 135° C.; the *German Pharmacopœia* "about 135° C."; the *French Pharmacopœia* at 135° C.; *New and Nonofficial Remedies,* 1917, 134–136°C. The Bayer Company, in the patent trial at Chicago a number of years ago, gave among the "four infallible tests" a melting point of "about 135° C." Several men have carefully determined the melting point in recent years. Emery and Wright[4] in 1912 found that "Aspirin, Bayer" melted at 130.5–131° C. In France, François[5] has determined the melting point of pure acetylsalicylic acid, which, according to his method, is 132° C. When various samples of acetylsalicylic acid were examined in this laboratory, it was found that the melting point of none was as high as that described in *New and Nonofficial Remedies* or the British, French, or German pharmacopœias when taken according to the general method of the *U. S. Pharmacopœia,* vol. 9, p. 596. On critical observation, it may be seen that the melting point of acetylsalicylic acid is preceded and accompanied by decomposition. If the sample in the melting tube is heated from the original room temperature of the bath to 120° C., the temperature of melting will be lower than if the bath is first heated to 120° C. and the melting-point tube then placed in the bath.[6] Thus the melting point of acetylsalicylic acid, like so many organic compounds which decompose and do not melt sharply, is unsatisfactory and cannot be taken as an "infallible test" of purity, especially when determined by different operators who do not give their method in detail. After making a large number of melting-point determinations of acetylsalicylic acid, alone and in parallel with other operators, it was decided to use the method described in the *U. S. Pharmacopœia* modified by first heating the bath to 120° C. before attaching the melting-point tube to the thermometer.

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[3] For reference to older literature see Beilstein, II, 1496 (889).

[4] "The Melting Temperature of Aspirin and Salicylic Acid Mixtures," *Proc. Assoc. Off. Agr. Chem.,* 1912; Bureau of Chemistry, Department of Agriculture, *Bull.* 162.

[5] "Assay of Aspirin," *J. pharm. Chim.,* 15 (1917), No. 7, 213.

[6] Similar observations were made by Emery and Wright, who state: "An accurate determination of the melting temperature in this way (the rate of heating was such as to give a rise in temperature of about 1° per minute) is rendered difficult by the fact that 'aspirin' decomposes on heating, as evidenced in the depression of the melting temperature of the pure substance of about 1° for every five minutes' heating just below its melting temperature."

The melting point of purified acetylsalicylic acid was found to be 131.5–132.5° C. (corr.).[7] With the exception of one specimen, which was obviously impure, the various specimens examined melted between 128° and 133° C. as may be seen in the accompanying table. It would appear that this range of melting points would be more acceptable and reliable than the melting points described in various standards.

PRESENCE OR ABSENCE OF FREE SALICYLIC ACID.—It is generally conceded that the presence of salicylic acid in amounts more than traces is deleterious. Furthermore, the mount of salicylic acid is a good index of the purity of the acetylsalicyclic acid, because the test is so delicate that, under favorable conditions, mere traces may be determined and, as a rule, the better the product, the less the amount of free salicylic acid.

The tests appearing in various pharmacopœias for salicylic acid as an impurity in acetylsalicylic acid do not give concordant results, different workers interpreting the results differently, nor are they detailed in such a manner as to yield maximum delicacy.

After experimentation, it was decided to establish a "limit" test of approximately 0.1 per cent. free salicylic acid, when carried out according to the following method:

> 0.1 G. of the substance was placed in a dry colorimeter tube and 1 Cc. of alcohol,[8] previously distilled over NaOH, was added. After the acetylsalicylic acid had dissolved, 48 Cc. of water and 1 Cc. of fresh 0.1 per cent. ferric chloride ($FeCl_3 \cdot 6H_2O$) solution were added. At the same time a control was run by treating 1 Cc. of a "standard" salicylate solution the same as above.[9] If within two minutes the color given by the acetylsalicylic acid is not more intense than the color given by the "standard," the presence of not more than 0.1 per cent. free salicylic acid[10] is proved.

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[7] Isolated crystals attached to the walls of the melting-point tube, apart from the bulk of acetylsalicylic acid, melted at a lower temperature.

[8] An excess of alcohol destroys or lessens the color when only a very minute amount of salicylic acid is present.

[9] The control should be made each time as standing in the air changes its tinctorial power.

[10] The presence of pure acetylsalicylic acid does not seem to affect the iron (Fe^{+++}) salicylic acid coloration. The small amount of acetic acid was added to the sodium salicylate control solution (1) to simulate an acidity approximating the acidity of the acetylsalicylic acid, and (2) since

The solutions used were prepared as follows:

Redistilled alcohol was treated with a small amount of sodium hydroxide for 24 hours, then again distilled.

The color standard was made by dissolving 0.116 G. of dried sodium salicylate in water, adding 1 minim of glacial acetic acid, and making up to 1,000 Cc. Each Cc. represents 0.1 Mg. of salicylic acid.[11]

The ferric chloride solution was made by diluting 1 Cc. ferric chloride ($FeCl_3 \cdot 6H_2O$) test solution U. S. P. with 99 Cc. of water. The diluted solution must be freshly prepared each day.

With one exception, all of the commercial specimens examined responded satisfactorily to the above test showing less than 1 part salicylic acid in 1,000 parts acetylsalicylic acid. The individual results are given in the accompanying table.

OTHER TESTS.—*New and Nonofficial Remedies,* 1917, requires that acetylsalicylic acid shall form a clear solution with warm sodium carbonate solution; that sulphates, chlorides and heavy metals shall be absent; that 0.5 Gm. shall leave no weighable ash. All the brands reported in this paper complied with these requirements.

So far there has been no satisfactory quantitative estimation of acetylsalicylic acid. True, various methods have been proposed, but they are objectionable. It was thought that hydrolysis of acetylsalicylic acid and then titrating the solution by comparing the color formed by ferric chloride with that of a standard control might yield interesting results, providing that the conditions were alike. For this purpose 1 Gm. of acetylsalicylic acid was dissolved in 10 Cc. of alcohol and diluted to 1,000 Cc. The solution was then heated at 98–100° C. for 2 hours, allowing the alcohol to evaporate, then allowed to stand at room temperature (22° C.) for 22 hours. After adding water sufficient to make 1,000 Cc., it was compared colorimetrically for salicylic acid strength. The amount of hydrolysis varied so with different samples under the same conditions that it was realized that an approximate assay by this method was unreliable. If the assay were made under more exact conditions, quan-

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acetylsalicylic acid gives by hydrolysis both acetic acid and salicylic acid, it was thought advisable to add acetic acid to the standard. If there is any free acetic acid in a sample of acetylsalicylic acid containing salicylic acid (which I believe is generally the case when salicylic acid is present) then it would modify the color given by the same amount of salicylic acid alone. For this reason it was thought to be more comparable to have the standard contain a slight amount of acetic acid.

[11] This standard is somewhat similar to the one proposed by T. W. Thoburn and Paul J. Hanzlik, *J. Biol. Chem.,* 23, 175.

MELTING POINT AND SALICYLIC ACID DETERMINATIONS.

Brand.	Melting Point Corrected.	Free Salicylic Acid Colorimetrically.
Acetylsalicylic acid, P. W. R.[12]	130.0–131.0°	Colored, but showing less than 0.1 per cent.
Acetylsalicylic acid, Millikin[13]	130.0–131.0°	No color.
Acetylsalicylic acid, Millikin[13] 5-grain capsules............	129.0–130.0°	No color.
Acetylsalicylic acid, Millikin[12] 5-grain capsules[14]..........	128.0–129.0° (*a*) 125.5–126.5° (*b*)	Colored, but showing less than 0.1 per cent. (*a*). Considerably more than 0.1 per cent. (*b*).
Acetylsalicylic acid, Squibb[13]..	131.0–132.0°	No color.
Acetylsalicylic acid (Aspirin),[12] Monsanto	131.0–132.0°	No color.
Acetylsalicylic acid, M. C. W.[12]	130.5–131.5°	Colored, but showing less than 0.1 per cent.
Acetylsalicylic acid, M. C. W.[12]	131.5–132.5°	Colored, but showing less than 0.1 per cent.
Acetylsalicylic acid, M. C. W.[12]	131.0–132.0°	Colored, but showing less than 0.1 per cent.
Aspirin, Bayer[12] (before patent expired)	131.5–132.5°	No color.
Aspirin, Bayer[12, 15] (after patent expired)	128.5–129.5°	Colored, but showing less than 0.1 per cent.
Aspirin, Bayer[12, 15] (after patent expired)	129.5–130.5°	Colored, but showing less than 0.1 per cent.
Aspirin, Lehn and Fink[13].....	130.5–131.5°	0.1 per cent.
Aspirin, Lehn and Fink[13].....	130.5–131.5°	Colored, but showing less than 0.1 per cent.
Aspirin, Lehn and Fink[12].....	131.0–132.0°	Colored, but showing less than 0.1 per cent.

titative comparisons might be possible. In one experiment, after 60 days the hydrolysis of the acetylsalicylic acid was 61 per cent., which is in rough agreement with the work of Tsaklatos and Horsh.[16]

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[12] Obtained on the open market.

[13] Obtained from manufacturer.

[14] One third of the capsules (*a*) contained a white powder; two thirds of the capsules (*b*) contained a pink powder having strong odor of acetic acid and not complying with the tests.

[15] Not described in "New Nonofficial Remedies"; the other products are.

[16] *Apoth. Ztg.*, 1915, p 247; *Bull soc. chim.*, 17 (1915), 401. "Studies of the decomposition of aspirin determined by titrametric methods and by conductivity measurements indicate that the reaction is exceedingly complex," T. and H., *Chem. Abs.*, 10, 591.

Discussion.—Apart from the proposed revision of the standards for the melting point and limit of salicylic acid in acetylsalicylic acid, the examination shows that there is no appreciable difference between the various brands of acetylsalicylic acid examined, all of them with one exception (acetylsalicylic acid, Millikin, 5-grain capsules, purchased on the open market) complying with the tests described in this paper. *The Journal of the American Medical Association,* in past years, has protested repeatedly against the monopoly given to the Bayer Company for their "Aspirin," contending that acetylsalicylic acid (aspirin) was not new, and that "Aspirin, Bayer" was simply a good brand of acetylsalicylic acid which could be bought in foreign countries at much lower prices than here. Although the patent in the United States has expired, "Aspirin, Bayer" is still being retailed at higher prices than other products which are now enjoying the privilege of American manufacture.

Mr. Paul Bakewell,[17] in an opinion answering the warning circular of the Bayer Co. in reference to the use of the word "aspirin" by firms other than Bayer, argues very ably that acetylsalicylic acid, before the patent was granted, meant the impure substance which was not used therapeutically, while "aspirin" was designated as the improved product (a new article of manufacture, the particular acetylsalicylic acid made under the Hoffman patent) and "is the substance now known in pharmacy as aspirin" (statement made by an officer of the Farbenfabriken of Elberfeld Co. in U. S. Circuit Court, 1909). The products reported in this paper are (with the one exception) the same as described in the Hoffman patent, and, in the sense of Mr. Bakewell's argument, are "aspirin." However, it would seem better if the name acetylsalicylic acid, instead of aspirin, were used, especially by physicians in their prescriptions because (1) it is a generic, scientific name; (2) "Aspirin, Bayer" is sold at higher prices than other products, whereas chemically equivalent products sold under the descriptive name may be purchased at a lower price. Finally, the manufacture of acetylsalicylic acid in this country is another example of the fact that American chemists can produce the drug synthetics, and at the same time make products as good as, if not better than, those of German origin.

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[17] "In the Matter of Aspirin. Answer to the warning circular of the Bayer Co. of June 1, 1917," by Mr. Paul Bakewell, Monsanto Chemical Works.

I express my appreciation to Dr. W. A. Puckner for his kind interest.

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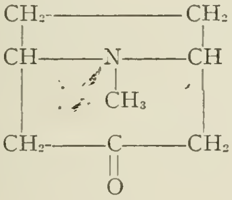
Chicago, Ill.

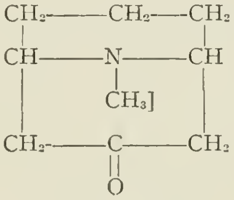
ANALOGUES OF ATROPINE AND HOMATROPINE.[1]

By Louis F. Werner.

The alkamine tropine, one of the hydrolysis products of atropine, is changed upon oxidation to the ketone tropinone. This ketone is closely related to another ketone known as pseudopelletierine, which occurs naturally in the bark of the pomegranate tree. The relationship between the two is shown by the following structural formulas:



Tropinone



Pseudopelletierine

As can be readily seen, pseudopelletierine differs from tropinone in that it has one carbon atom and two hydrogen atoms more than tropinone.

Tropinone upon reduction is converted into two stereoisomeric alcohols. Upon being reduced electrolytically, or with concentrated hydriodic acid and zinc dust, it is reduced to tropine, but if reduced with sodium and alcohol it yields pseudotropine, a stereoisomer of tropine. These two stereoisomers have different physical properties, and the esters of these alcohols with the hydroxy acids have different physiological properties.

Pseudopelletierine upon reduction also gives two stereoisomeric compounds. Ciamician and Silber[2] found that an alkamine was formed upon reducing pseudopelletierine with alcohol and sodium, which they named methylgranatoline. The author found that a stereoisomer is formed by reducing pseudopelletierine with concentrated hydriodic acid and zinc dust, which may therefore be called iso-methylgranatoline. These two isomers have different physical properties, as is the case of the two reduction products of tropinone.

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[1] From the *Journal of the American Chemical Society*, April, 1918.

[2] *Ber.*, 26, 2740 (1893).

As was stated, an important difference in the properties of the reduction products of tropinone lies in the different physiological activities of the esters of the hydroxy acids with these alcohols. Thus the tropic acid ester (atropine), and the mandelic acid ester (homatropine) of tropine have strong mydriatic power, whereas the tropic acid esters and the mandelic acid ester of pseudotropine are devoid of such properties.

The object of the work undertaken was: To prepare the second reduction product of pseudopelletierine which was theoretically possible, and then to determine any difference in the physiological activities of the tropic acid and mandelic acid esters of these two stereoisomers.

The hydrobromides of the mandelic acid and tropic acid esters of isomethylgranatoline were prepared, and were found to have no mydriatic powers. These two artificial alkaloids were not obtainable in a crystalline condition, it being necessary to isolate them, and purify them in the form of their hydrobromides.

The hydrobromides of the mandelic acid and tropic acid esters of methylgranatoline were also prepared, and were found to have strong mydriatic properties. The hydrobromide of the tropic acid ester was obtained as a crystalline powder, but the hydrobromide of the mandelic acid ester was obtained as a syrup only.

From the viewpoint of physiological activity alone, tropine and methylgranatoline should constitute one type of stereoisomer, that is, the type whose hydroxy acid esters have mydriatic power, whereas pseudotropine and iso-methylgranatoline are another type of isomer whose hydroxy acid esters are lacking in mydriatic powers.

From the standpoint of physical properties we would predict different results from those found above, as we would naturally group tropine (m. p. 63°) and iso-methylgranatoline (m. p. 65°) together and pseudotropine (m. p. 108°) and methylgranatoline (m. p. 100°) together. From the analogy in the methods of preparation of tropine and iso-methylgranatoline, and of pseudotropine and methylgranatoline we would classify these compounds into these two groups also. Thus methylgranatoline is prepared by reducing pseudopelletierine with alcohol and sodium, and pseudotropine is prepared from the corresponding ketone tropinone in analogous manner: iso-methylgranatoline and tropine are both prepared from the corresponding ketones by reduction with zinc dust and hydriodic acid. These results show the uncertainty of associating similarity of chemical and physical properties of compounds with similarity in physiological behavior.

EXPERIMENTAL.

Preparation of Methylgranatoline.—The method used by Ciamician and Silber,[3] slightly modified, was followed. Ten Gm. of pseudopelletierine were dissolved in 200 Cc. of ethyl alcohol, and metallic sodium added until no more would dissolve, the reaction being carried out in a flask heated by a metal bath. Water was then added, and the alcohol distilled off, and the aqueous alkaline residue made acid with hydrochloric acid. This acid solution was then saturated with sodium bicarbonate, and the unchanged pseudopelletierine removed by shaking out with chloroform. The solution was then made strongly alkaline with sodium hydroxide solution, and the methylgranatoline shaken out with chloroform. Upon drying the chloroform solution over anhydrous sodium sulphate, the methylgranatoline was obtained as a crystalline solid upon distilling off the chloroform. Upon recrystallizing from petroleum ether, the pure compound is secured, melting at 100° (uncorr.).

Preparation of Iso-methylgranatoline.—The method used was analogous to that used by Willstaetter[4] in reducing topinone to tropine. Ten Gm. of pseudopelletierine were dissolved in 120 Gm. of conc. hydriodic acid (sp. gr., 1.96), and was then cooled to 0°. Twenty Gm. of zinc dust were then added, stirring constantly, and the temperature was not allowed to rise above 0°. The reaction required about two hours. The mixture was allowed to stand for 24 hours, and then an excess of sodium hydroxide solution added, and the mixture shaken out with chloroform. This chloroform solution contained both pseudopelletierine and the new alcohol. In order to separate the two, the chloroform solution was shaken out with an excess of dil. hydrochloric acid, and after separating from the chloroform, the acid solution was saturated with sodium bicarbonate. This solution was then shaken out with chloroform to remove the pseudopelletierine, and then made strongly alkaline with sodium hydroxide solution, and the iso-methylgranatoline shaken out with chloroform. After being dried over anhydrous sodium sulphate, the alkamine is obtained as a crystalline residue upon removing the chloroform. It was then recrystallized from petroleum ether. The base is readily soluble in water, alcohol, and chloroform, but less soluble in petroleum ether. M. p. 65° (uncorr.).

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[3] *Ber.*, 26, 2740 (1893).

[4] *Ibid.*, 33, 1174 (1900).

Subst., 0.2515; N, 20.25 Cc. at 761 Mm. and 21°; collected over 30 per cent. KOH solution.

Calc. for $C_9H_{17}NO$: N, 9.032 per cent. Found: 9.310 per cent.

Preparation of the Hydrobromide of Tropic Acid Ester of Iso-methylgranatoline.—Three Gm. of iso-methylgranatoline and 3 Gm. of tropic acid were dissolved in 10 per cent. hydrochloric acid, and the mixture heated for 70 hours on a water bath, the acid being replaced from time to time as it evaporated. The mixture was then diluted with water, and the excess tropic acid removed by shaking out with ether. Ammonia in excess was then added to the aqueous solution, and the ester shaken out with a little chloroform. The chloroform solution was extracted then with dilute hydrobromic acid, avoiding an excess. This aqueous solution of the hydrobromide was evaporated to dryness in a vacuum desiccator over conc. sulphuric acid. The dry residue was then recrystallized from absolute ethyl alcohol. It was found necessary to repeat the recrystallization several times to completely remove all ammonium bromide. The product so obtained was a white crystalline powder, turning yellow upon prolonged exposure to the light. It is soluble in water or hot alcohol, less so in cold alcohol. M. p. 233° (uncorr.).

Subst., 0.3909; N, 13.20 Cc. at 757 Mm. and 26°; collected over 30 per cent. KOH solution.

Calc. for $C_{18}H_{26}NO_3Br$: N, 3.64 per cent. Found: 3.76 per cent.

Preparation of the Hydrobromide of the Mandelic Acid Ester of Iso-methylgranatoline.—Three Gm. of iso-methylgranatoline and 3 Gm. of mandelic acid were dissolved in 10 per cent. hydrochloric acid, and were heated for 70 hours in an evaporating dish upon a water bath. The hydrochloric acid which evaporated was replaced, from time to time, by the addition of new acid. Only sufficient acid was added to keep all the reacting products in solution. At the end of the time stated, the reaction mass was diluted with a little water, and the excess mandelic acid removed by shaking out with ether. The alkaloid was liberated by adding ammonia water in excess and was then taken up with a little chloroform. The hydrobromide was secured from this chloroform solution by shaking out with dil. hydrobromic acid, and evaporating the aqueous solution in a vacuum desiccator over sulphuric acid. The pure hydrobromide is secured by recrystallizing the crude salt from absolute alcohol. M. p. 229° (uncorr.). The salt is readily soluble in water or hot alcohol, slightly soluble in cold alcohol.

Subst., 0.4155; N, 14.50 Cc. at 763 Mm. and 25°; collected over 30 per cent. KOH solution.

Calc. for $C_{17}H_{24}NO_3Br$: N, 3.78 per cent. Found: 3.93 per cent.

Preparation of the Hydrobromide of the Tropic Acid Ester of Methylgranatoline.—Four Gm. of methylgranatoline and 4 Gm. of tropic acid were heated for 70 hours in an evaporating dish on a water bath with 0.25 per cent. hydrochloric acid. Sufficient acid was added from time to time to keep all the reacting substances in solution. At the end of this time the mixture was acidified with conc. hydrochloric acid, and the unchanged tropic acid removed with ether. The aqueous solution was then made alkaline with ammonia water, and the base taken up with chloroform. The hydrobromide was formed by extracting the alkaloid from the chloroform by shaking out with dilute hydrobromic acid. Upon evaporating this aqueous solution in a vacuum desiccator over sulphuric acid, the crude hydrobromide was secured, which was purified by recrystallization from absolute alcohol. M. p. 220° (uncorr.). The salt is readily soluble in water and hot alcohol, slightly soluble in cold alcohol.

Subst., 0.4209; N, 14.10 Cc. at 759 Mm. and 20°; collected over 30 per cent. KOH solution.

Calc. for $C_{18}H_{26}NO_3Br$: N, 3.64 per cent. Found: 3.84 per cent.

Preparation of the Hydrobromide of the Mandelic Acid Ester of Methylgranatoline.—This compound was made by heating 4 Gm. of mandelic acid and 4 Gm. of methylgranatoline with 0.25 per cent. hydrochloric acid in sufficient quantity to keep all the reacting substances in solution. After heating for 70 hours, the mixture was acidified with hydrochloric acid, and excess mandelic acid removed by shaking out with ether. The aqueous solution was then made alkaline with ammonia water, and the ester shaken out with chloroform. The hydrobromide was secured as a viscous syrup upon extracting this chloform solution with dil. hydrobromic acid, and evaporating *in vacuo* over sulphuric acid. The sulphate and the hydrochloride were also made, but these also were obtained as syrups only. No analysis was attempted of these viscous products.

CONCLUSION.

The results of the work show that, analogous to tropinone, pseudopelletierine gave two stereoisomers upon reduction. Similar to the two isomers secured by the reduction of tropinone, one of these isomers when converted to the tropic or mandelic acid ester had no mydriatic properties, whereas the tropic and mandelic acid esters of the other had strong mydriatic effects. Use of the physical properties and methods of formation of these isomers was shown to be unreliable as a method of predicting their probable physiological effects.

The author wishes to express his gratitude to the Cincinnati Board of Health, in whose laboratory he was given the opportunity to determine the physiological effects of these alkaloids.

CINCINNATI, OHIO.

OIL CONTENT OF MANCHURIAN SOY BEANS.[1]

BY CONSUL A. A. WILLIAMSON, DAIREN.

The Dairen mills state that they are able to express about 12 per cent. of oil from soy beans, and the extraction mill, it is stated, obtained 20 per cent. But, as it is axiom that 48 kin of beans make a 4-kin cake and 4 kin of oil, the average proportion of oil obtained cannot exceed one twelfth, or 8⅓ per cent. In a long series of chemical analyses (119) to determine the oil content of beans, covering several years and all important production points, none containing full 20 per cent. of oil were found. The oil content varies considerably with the place of production, weather during growing season, etc., but just what the causes are is not yet apparent, probably soil and weather being the most powerful determining factors. The highest oil content found in the series was 19.88 per cent. in a sample from Changchun, but several ran over 19 per cent., while 14.72 per cent. was the lowest of the series, the remainder varying between the two extremes. In order to arrive at a proper average for the oil content of beans, 50 analyses were taken, and the result shown was 17.10 per cent. of oil, which is therefore a fair average quality (f. a. q.) bean-oil content. Anything above that, as 18 or 19 per cent., would indicate extra quality beans, and those with less than 17.10 per cent. of oil would be poor quality beans.

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[1] Supplementing report published in *Commerce Reports*. See also report on the methods of making soy-bean oil, AMERICAN JOURNAL OF PHARMACY, February, 1918, p. 139.

JAPANESE BLACK MINT.[1]

By Vice-Consul E. R. Dickover, Kobe.

Inquiry has come from the United States as to the feasibility of sending to that country black mint plants, from which menthol crystals and oil are made. Several attempts have been made in the past to send specimens of the mint plant to America, but all have resulted in failure. They can not be sent by ordinary freight, as the two or three weeks' trans-Pacific journey dries out the roots, resulting in the death of the plants. At one time, I am informed, special arrangements were made with the purser of a steamer and a shipment of mint plants were safely carried across the Pacific, being watered at suitable intervals; but upon arrival in America they were disinfected, and died as a result of this treatment. At present the Kobe consulate is making efforts to obtain mint seeds, but as the plant is usually propagated by slips or root-cuttings it has been found almost impossible to obtain seeds.

The black mint plant is grown in Japan, in two widely different climates. About 92 per cent. is grown on the Hokkaido (Yezo), the large northern island, where the average winter temperature is about 22° F., with a minimum of 10° F. below zero, and the average summer temperature is about 60° F., with a maximum of about 90° F. The average yearly rainfall is about 38 inches. The remaining 8 per cent. of the mint is grown in the prefectures of Okayama and Hiroshima on the main island, where the average winter temperature is about 38° F., with a minimum of about 20° F., and the average summer temperature is about 75° F., with a maximum of about 98° F. The average yearly rainfall in this district is 42.5 inches. As can be seen from this, the greatest part of the mint is grown in a climate similar to that of Virginia or North Carolina.

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[1] From *Commerce Reports*, May 7, 1918.

The mint plant requires a light, well-drained soil. The roots are planted (in Hiroshima and Okayama) at the end of November and the beginning of December. The plant attains its full growth during the summer months and is cut in the latter part of July, during August, and in the early part of September, three cuttings being made during the season. The third cutting yields the greatest percentage of oil and menthol crystals. The leaves are steamed and pressed in barrels by the planters, who then ship them to the menthol factories, of which there are 74 in various parts of Japan. There the oil is extracted from the leaves by a process of freezing and pressing.

THE NINETY-SEVENTH ANNUAL COMMENCEMENT OF THE PHILADELPHIA COLLEGE OF PHARMACY.

The ninety-seventh annual commencement exercises of the Philadelphia College of Pharmacy were held during the week commencing June 2. The Baccalaureate Services were held at the Church of St. Luke and the Epiphany on Sunday, June 2, at four P.M. The Rev. David M. Steele delivered, in his happiest mood, a very appropriate sermon to the students full of kindly advice and suggestion.

The complimentary supper tendered by the faculty to the graduating class was held in the College Hall on Monday evening and was a joyous occasion marred only by the absence of and the recollections of the loss of Prof. Remington.

The fifty-fourth anniversary reunion and dinner of the Alumni Association was held at Kugler's on Chestnut Street near Broad on Tuesday evening. The "three's and eight's classes" had the right of way this year and by their enthusiasm demonstrated their loyalty to their Alma Mater.

> "Whose echoes live in memory yet
> Though envious years would say forget."

The annual Commencement was on Wednesday evening, June 5, at the American Academy of Music. The address to the students was by Rev. Charles A. Eaton. The honorary degree of Master in Pharmacy (Ph.M.) was conferred on Professors E. Fullerton

Cook and Otto Raubenheimer. The degree of Master in Pharmacy *in course* was conferred upon the following candidates, Robert P. Fischelis, W. Wilson McNeary, Paul S. Pittenger.

Diplomas and certificates were conferred upon 162 students as per the following list.

DOCTORS IN PHARMACY (PHAR.D.).

Name.	Thesis.	Where From.
Di Silvestro, Miss Elisa	Actinella Odorata	Italy
Nichols, Adley Bonisteel	The Purification of Commercial Wool-Fat	Wisconsin
Raubenheimer, Herbert Carl	Churchill's Tincture of Iodine	New York

DOCTORS IN PHARMACY (P.D.).

Students who have completed examinations and requirements for the degree of Doctor in Pharmacy (P.D.) who matriculated in 1915 or at a prior date:

Costello, Miss Genevieve Marie (P.C.)	Vanilla	Pennsylvania
Crane, Claude Harold	Antipyrine	No. Carolina
Hering, George (P.C.)	Tincture of Strophanthus	New Jersey
Leh, Elwood Henry	Cheap Liquid Soaps	Pennsylvania
Lenninger, Clifford (P.C.)	Tincture of Stropanthus	Wyoming
Price, John Wesley	Relations between the Pharmacist and the Physician	Pennsylvania
Russell, Miss Lillian (P.C.)	Magnesii Carbonas	Pennsylvania
Shoemaker, Alfred Weikel	Window and Show Case Trimming	Pennsylvania
Shumaker, Ralph Ritter	Artificial Maple Flavoring	Pennsylvania
Streamer, Charles Hayden Alexander (M.S.)	Chemistry of Iron	Pennsylvania
Thomas, John Aubrey	Sterilization	Pennsylvania
Weagley, Marburg Downin	"Ambrine"	Pennsylvania
Weiss, Edward Louis	Liquor Plumbi Subacetatis	Pennsylvania

PHARMACEUTICAL CHEMISTS (PH.C.).

Garr, Hyman David	Limit Tests for Methyl and Ethyl Alcohol	Pennsylvania
Herman, Abraham Lincoln	Analysis of Benzaldehyde	Pennsylvania
Hoffstein, Benjamin H.	Determination of Camphor Spirits and Liniment by Polariscope	Pennsylvania
McLaughlin, John R., Jr.	Direct Estimation of Sodium Benzene Sulphonate	Pennsylvania
Morgan, Thomas Asaph	Benedict's Solution	Pennsylvania
Snyder, Charles A.	Hypophosphorous Acid	Pennsylvania

GRADUATE IN PHARMACY (Ph.G.).

Name.	Thesis.	Where From.
Barreras, Fernando	"Amygdala Dulcis" (Sweet Almond)	Porto Rico
Berkenstock, Mark John	Adulteration of Crude Drugs	Pennsylvania
Bogroff, Miss Rebecca	Bitter Almonds and Their Products	Pennsylvania
Boltz, Albert Dillman	Iodine and Its U. S. P. Preparations	Pennsylvania
Bond, Curtis Humphrey	Cosmetics, Purposes and Uses	Pennsylvania
Brady, Roscoe Owen	Non-Abrasive Antiseptic Tooth Paste	Pennsylvania
Bratton, Franklin Clair	Substitution of Corn Syrup for Sugar in the Manufacture of Soda Fountain Syrups	Pennsylvania
Brisgol, Morris	Solution of Magnesium Citrate	Pennsylvania
Brown, Leroy C. Parkman	Root of Eriogonum Tomentosum	Pennsylvania
Brustin, Miss Marie F.	The Louisiana Sulphur	Russia
Burns, Miss Helen	Comparative Anatomy of Nux Vomica and Ignatia	Pennsylvania
Cartwright, Joseph David	Thymol	Pennsylvania
Coffey, Hiram Myers	"Fourth Edition of the National Formulary"	Pennsylvania
Cook, William Donald	Magma Magnesia	Pennsylvania
Curran, Albert Alphonsus	Advertising the Professional Drug Store	West Virginia
Diaz, Julio	Cultivation and Industry of Coffee in Porto Rico	Porto Rico
Eberly, Earle Kendig	Mineral Oil	Pennsylvania
Edwards, William Mason		Pennsylvania
Egan, Vincent Aloysius	Rhus Glabra	Pennsylvania
Ellis, Leslie	Chionanthus	Illinois
Finkelstein, Herman	Quality of Solution of Hydrogen Dioxide	Russia
Flood, James John	Solution of Magnesium Citrate	Pennsylvania
Foulk, James Floyd	Camphor	Pennsylvania
Garcia, (Birba) Ricardo	Cassava Starch	Cuba
Gardier, Louis Anthony	Picric Acid	Pennsylvania
Garvin, Luther B.	Micromorphology of Stramonium and Belladonna and the Possibilities of Daturine as a Substitute for Atropine	Pennsylvania
Glantz, Morris	Lime Water	Pennsylvania
Glauser, Jacob	Pharmacognosy of Two Varieties of Aconite	Pennsylvania
Green, Harry		Pennsylvania
Green, Simon	Method of Standardization of Suprarenal Glands	Pennsylvania

Name.	Thesis.	Where From.
Gubenko, William P.	The International Metric System	Pennsylvania
Halligan, J. Clement	Petrolatum Liquidum	Pennsylvania
Hawkins, James Bryon	Tincture of Iodine	Montana
Hayes, Albert H.	Capsulating	Pennsylvania
Hooper, Herbert Hill	Cascara Sagrada	Pennsylvania
Hymes, David	Pepsin and Its Preparations and their Uses	Pennsylvania
Irete, Frank Lewis	Hydrastis Canadensis	Pennsylvania
Jorczak, Stanley Francis	Liquid Petrolatum	Connecticut
Karlheim, Dennis William	Chain Store System	Pennsylvania
Keller, Alexander George, Jr.		Pennsylvania
King, Standish Boardman	Browning	Massachusetts
Klebanoff, Bernard	Magma Bismuthi	Pennsylvania
Lacktman, Miss Jane	Serums and Vaccines	Russia
Lee, Joseph Lester	Crylolite	Pennsylvania
McBride, Thomas L.	Gossypium	No. Carolina
Marshall, William Crauthers	Proximate Coal Analysis	Pennsylvania
Matthews, Harold Clifford	Hops (Humulus Lupulus)	New Jersey
Melamed, Solomon	Soap Sold for Pure Castile	Pennsylvania
Menger, Miss Ruth Caroline	Face Creams	Pennsylvania
Merkin, Israel	Prunus Serotina and its Chief Adulterant	Pennsylvania
Miller, George McCrea	Angustura Bark	Pennsylvania
Morales, Conrad		Cuba
Murphy, Frank Anthony	Iodine and Its Uses	Pennsylvania
Newsom, Henry Clay	Aspidium	No. Carolina
Packard, Miss Karleen	The History of Important African Drugs	Pennsylvania
Parris, Miss Bertha	Collection of Leguminous Drugs	Russia
Phillipy, William Tell	Rabies, and the Pasteur Treatment	Pennsylvania
Puget, Jose Antonio	Tuberculins	Cuba
Rabinowitz, Miss Charlotte Gertrude	Phenol	Pennsylvania
Ramirez Hermogenes (Cabrera)		Cuba
Rappoport, Isadore	Sulphur in Ointments	Russia
Sackaloucas, Joseph William	Cultivation of Solanaceous Drugs	Pennsylvania
Seidelman, Miss Ida	Commercial Varieties of Capsicum Annum	Pennsylvania
Shafer, Herman S.	Emulsion of Cod Liver Oil	Pennsylvania
Smith, George Leo	Possibilities of a Modern Ethical Pharmacy	Pennsylvania
Sparks, Miss Ruth Everest	Emulsions	New Jersey
Stein, Milton	Advertising in Pharmacy Today Compared with Thirty Years Ago	Pennsylvania

Name.	Thesis.	Where From.
Swabon, John Joseph	Cultivation of Belladonna	Pennsylvania
Tu, Kuen-Hua	Manufacture of Rice Starch	China
Turner, Charles Chester Currington	Glucose	Pennsylvania
Vehrs, Ernest Edward	Solubility of Cocaine and Codeine Alkaloids in Oils	Ohio
Walker, Lynne D.	Drug Store Advertising	Pennsylvania
Weitzman, Sydney Alan	Attracting the Public	Pennsylvania
Witman, Theodore David	Camouflaged Pharmaceuticals	Pennsylvania
Yob, John Thomas	Physiological Action and Therapeutic Uses of Atropine	Pennsylvania
Zacharias, Christian Boyd	Know the Drugs You Sell	Pennsylvania

Students who have completed the examinations and will receive their diploma upon reaching their majority:

Goodhart, Floyd R.	Infusion of Digitalis	Pennsylvania
Keiser, Paul Raymond	Own Make Greaseless Creams	Pennsylvania
Kerchner, Robert	Adulteration of Drugs	Pennsylvania
Pitchard, Frederick R.	Phenol and a Fallacy Thereof	Pennsylvania
Quinn, Edward Schley Francis	The Cultivation of Castor Oil Plants	Pennsylvania
Rappaport, Nathaniel Herman	Unguentum Hydrargyri Nitratis	Pennsylvania
Rotman, Harry	Ergot, Preparation, Standardization and Uses	Russia
Schlegel, Alvin Lester	Modern Merchandising	Indiana
Shute, Joseph	Rheum (Rhubarb)	Pennsylvania
Snyder, Harold Berlin	Drug Store Policies	Pennsylvania
Stock, Roy Albert	A Few Facts about the More Important Vaccines	Pennsylvania
Troutman, Aaron J.	A Pharmacist in a Small Town	Pennsylvania
Walter, William John[1]		Pennsylvania
Wenner, John Alfred	Apidosperma, or Quebracha Bark	Pennsylvania

Students who have passed all Second Year Examinations and are eligible for the Degree of Ph.G. when the other graduation requirements shall have been met, and who will receive a Certificate attesting to these facts:

Abrams, Henry Reuby	A More Permanent Stramonium Ointment	Pennsylvania
Bair, Guy Frederick	Papain	Pennsylvania
	Tincture of Nux Vomica	Pennsylvania
Beechwood, Miss Mary Elizabeth	History of Several Official	
Brody, Miss Reba	South American Drugs	Russia

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[1] Thesis not required.

Name.	Thesis.	Where From.
Brown, Israel	Iodine	Russia
Cantor, Benjamin H.	Relations with Wholesale Druggists	Pennsylvania
Davis, Miss Mae	Advertising in Pharmaceutical Journals	Pennsylvania
Duvoisin, Miss Lily	Oil of Betula as the Source of Salicylates	Pennsylvania
Eskin, Miss Sara	Manufacturing of Pharmaceutical Glassware	New Jersey
Filippone, Gaetano	Urinalysis	Italy
Finegan, William Francis	The Pituitary Body	New Jersey
Glass, Raphael	Cultivation of Belladonna	Pennsylvania
Godlewski, Charles Francis	Cinchonas	Pennsylvania
Judd, James Frederick	The Official and Unofficial Gall	Pennsylvania
Lower, John Wesley	Calx Chlorinata	Pennsylvania
Lung, Kwai Shoon	Four Typical Chinese Crude Drugs	Hawaii
McKendick, Wm. James	Pituitary Substance	Pennsylvania
Mandelbaum, Benjamin	Alcohol and Some of its Effects on the Human System	Pennsylvania
Promislo, Charles	Belladonna and Its Adulteration	Pennsylvania
Rabin, William Hagedorn	Facts Regarding Arsenic Trioxide on the Horse and Rat	Pennsylvania
Reubush, Robert Floyd	Comparison of Prescriptions	Virginia
Rohr, Reuben Abraham	Acetphenetidin	Pennsylvania
Rosenwald, Hymen	Dichloramine T	Pennsylvania
Schadt, Morris Granville	Iodine	Pennsylvania
Siemiontkowski, Miss Pauline	Perfumery	Pennsylvania
Slothower, George Ammon	Detection of Bichloride in Calomel	Pennsylvania
Slotter, Charles Franklin	Emetine	Pennsylvania

CERTIFICATE OF PROFICIENCY IN CHEMISTRY.

Huber, Donald Witherow, P.D.	Pennsylvania
McCorristin, Leo Joseph	New Jersey
Neeld, Percy Ingham	Pennsylvania
Schulhoff, Arthur S.	Pennsylvania
Slack, A. Schuyler	New Jersey

CERTIFICATE OF PROFICIENCY IN THE FOOD AND DRUG COURSE.

Henderson, Clarence Harry	California

SPECIAL CERTIFICATE IN ANALYSIS OF INDUSTRIAL PRODUCTS.

Kane, Bernard	Pennsylvania
Mervine, Joseph	Pennsylvania
Wishnefsky, Harry	New Jersey

SPECIAL CERTIFICATE IN ANALYSIS OF FUELS, OILS AND WATER.

Roberts, Everett Joseph	Pennsylvania

CERTIFICATE IN BACTERIOLOGY.

Comas, Miss Mercedes Elvira	Cuba
Feeny, Leonard A.	Pennsylvania
Folkrod, Cyril C.	Utah
Inman, Miss Florence Vatier	Missouri
Jorczak, Stanley Francis	Connecticut
Margerum, Donald C.	Pennsylvania
Martinez, Miss Carmen Aurora	Cuba
Martinez, Miss Matilde	Cuba
Mattson, H. Leo, P.D.	Pennsylvania
Myers, William Bryan	Pennsylvania
Reiter, George Hager	New Jersey
Steward, Charles Robert	Idaho
Whitehead, Russell Edward	Pennsylvania

CERTIFICATE IN ADVANCED PHARMACY.

Abrams, Henry Reuby	Pennsylvania

CERTIFICATE IN PHYSIOLOGIC ASSAYING.

Abrams, Henry Reuby	Pennsylvania
Green, Simon	Pennsylvania
Guici, Arnold	Italy

ANNUAL MEETING OF THE NATIONAL PHARMACEUTICAL SERVICE ASSOCIATION.

The June meeting of the National Pharmaceutical Service Association, which was also the annual meeting of that body, was held at the Philadelphia College of Pharmacy, on Tuesday Evening, June 11.

The chief features of the meeting were the reports of the officers. President Beringer reviewed the efforts of the Association in the drafting of the Edmonds Bill and having it introduced, and made a plea for greater coöperation on the part of pharmaceutical bodies generally, in making the movement for the Pharmaceutical Corps a success.

Secretary Robt. P. Fischelis reviewed the propaganda work that had been carried on during the year and announced that the membership now totaled to about 1,400. He earnestly requested the Association to relieve him from the duties of the secretaryship because of pressure of business and other association work.

All of the officers were given a vote of thanks for their efforts during the year and the following were elected to serve for the term of 1918–19:

President—George M. Beringer,
Vice-President—Charles H. LaWall,
Secretary—E. Fullerton Cook,
Treasurer—Josiah C. Peacock.
Executive Committee—
Joseph W. England, Philadelphia,
C. A. Mayo, New York,
Eugene G. Eberle, Philadelphia,
Samuel C. Henry, Chicago,
Louis Werner, Cincinnati,
Ambrose Hunsberger, Philadelphia,
Robert P. Fischelis, Philadelphia,
F. E. Stewart, Philadelphia,
William D. Robinson, Philadelphia.

Communications regarding the work of the Association and applications for membership should be addressed to Prof. E. Fullerton Cook, Secretary, at 145 North Tenth Street, Philadelphia.

CORRESPONDENCE.

THE FAIRCHILD SCHOLARSHIP.

Philadelphia, June 10, 1918.

To the Members of Schools of Pharmacy, Boards of Pharmacy and Pharmaceutical Publications:

The following notice has been authorized:

Postponement of Examination for the Fairchild Scholarship Scheduled for June 25, 1918.

In order to establish a plan of award for the Fairchild Scholarship in line with recommendations which should receive further consideration by the committee, I hereby give notice of postponement of such examination scheduled for June 25, 1918. Decision will be withheld until the A. Ph. A. Convention, at which time a meeting of said committee will be held. At latest, announcement will be made September 1, and scholarship awarded by October 1, 1918.

H. C. Christenson, *Chairman,*
Committee on Examination for Fairchild Scholarship,
4149 Vincennes St., Chicago, Ill.

Other members of the Committee are:

R. A. Lyman, Lincoln, Neb.,
J. W. Sturmer, Philadelphia, Pa.,
Geo. C. Diekman, New York.

Chairman H. C. Christensen desires that notice be given of the above. The plan under consideration by the committee is in line with Recommendation 5 of President R. A. Lyman's address. The committee will hold a meeting during the Convention of the American Pharmaceutical Association in conjunction with the Fairchild Scholarship Committee.

In the meantime schools of pharmacy should prepare records of the qualifications of their leading students for the Fairchild Scholarship in line with Recommendation 5 of President R. A. Lyman's address, and which reads:

> *Recommendation No. 5.*—That it be the sense of the Conference that Mr. Fairchild could render the greatest service to pharmacy by offering the Scholarship to a graduate pharmacy student, in order that he might pursue some research problem for one full school year, in the school of his choice;

and further, that this scholarship be awarded on the basis of the applicant's scholastic training, his standing as an undergraduate pharmaceutical student and upon his fitness to do research.

The action of the joint bodies at Indianapolis is recorded in the minutes of this meeting on pp. 60–64, inclusive, of the January issue, 1918, *Journal A. Ph. A.* A careful study of these pages is suggested.

It would seem advisable that each school decide on an eligible candidate for the Fairchild Scholarship. It is also advised that a record be kept of the preliminary education possessed by the prospective candidates, of their pharmaceutical training and education, of their ability to do research work.

The suggestion has been made, although this has not, as far as we know, been definitely agreed upon, that each school of the Conference propose *one* candidate, and that the deans of the schools furnish the Fairchild Scholarship Examination Committee with data which will form the basis of their decision.

Doubtless Chairman Christensen will notify all schools of the Conference, as promptly as is possible, of the conclusions reached by the committee, and make definite requests for information from them that is necessary for making the award. The plan does not contemplate any other examination, and therefore award will be made in time for next school term.

Schools and boards of pharmacy should confer with Chairman H. C. Christensen, whose address is 4149 Vincennes Ave., Chicago, Ill.

Respectfully,

E. G. Eberle,
Chairman Fairchild Scholarship Committee.

A CORRECTION.

In the paper on "A Method for Cleaning Digitalis with a Study of the Inorganic Constituents," which was published in the April 1918, issue of this journal, the paragraph on page 249 relating to the qualitative determinations should read beginning with the fourth line as follows: Positive reactions were obtained from each of the above samples for iron, aluminum, manganese, calcium, magnesium, potassium, sodium, silicon, carbonates, chlorides, sulphates, and phosphates. Negative results were obtained for lead, mercury, silver, bismuth, copper, cadmium, arsenic, strontium, tin, chromium, cerium, nickel, zinc, cobalt, barium, antimony, lithium and nitrates.

C. H. ROGERS.

BOOK REVIEWS.

PHARMACEUTICAL BOTANY. By Heber W. Youngken, Ph.G., A.M., M.S., Ph.D. Second Edition, Revised and Enlarged with 195 Illustrations. Publishers P. Blakiston's Son & Co. Philadelphia.

This book has been written by a teacher of pharmacognosy who appreciates that with the adoption of pharmacognostic standards for many of the drugs in the U.S.P. and N.F., that pharmacognosy is to assume a still more important rôle in the curricula of pharmacy schools. Furthermore, that for the student of pharmacy to master the intricate subject of pharmacognosy, a "rather extended foundation in structural botany stands out preëminently as the most needed requirement." So this book has been especially prepared to meet the needs of pharmacy students.

The subject matters presented in this comparatively small volume of 386 pages are such as are necessary for the studies of the undergraduate and the more detailed studies of the structures of individual drugs have not been generally attempted. Very properly such are left to the special treatises to be considered in postgraduate studies. The attempt throughout this work appears to lay a thorough foundation for the student who is limited by the time allotted to this branch of pharmaceutical education, so that he nevertheless may acquire an intelligent understanding of the official standards.

The division of the subject and the systematic arrangement in chapters is admirable. The definitions, descriptions and statements are clearly, accurately, concisely, and not too technically stated, so that the readability is maintained and a subject that is prone to be looked upon as dry is presented in an inviting form.

In a subject so voluminous and intricate as pharmacognostical botany, it is impossible to give to the pharmacy student in the time allowed in the school course more than the foundation and the plan of teaching the fundamental plant structures by taking up the life history of a type appears to be a wise method of obtaining the best results.

Many of the illustrations are well executed and many are exceedingly appropriate as representing the text. A few, however, could have been improved upon, especially the microphotographs which in some instances exhibit the imperfection of the sections from which they have been prepared. For the purpose of clearly presenting illustrations of microscopic appearances, free-hand drawings would possibly have been better. In a few cases more appropriate illustrations representing official drug plants might well have been selected.

On the whole, this will prove a most useful guide and handbook for the pharmacy student and especially to those whose preliminary education in botany was very limited or had no bearing on the special application thereof to drugs. The student who studies it as a textbook will not fail to have a fair basic knowledge of pharmaceutical botany and a clear understanding of the official standards for organic drugs.

G. M. B.

ANIMAL PARASITES AND HUMAN DISEASE. By Asa C. Chandler, M.S., Ph.D. Instructor in Zoölogy, Oregon Agricultural College, Corvallis, Oregon.

The volume is divided into three parts.

The author enters upon the interesting discussion of Protozoa in Part I, commencing with a brief consideration and historical review of exotic diseases, infection, immunity, and anaphylaxis. Chapter IV, comprising thirty-six pages, deals with the Spirochætes. Here the author has placed the important facts of our knowledge of relapsing fever, syphilis, yaws and infectious jaundice into form for the lay reader. He considers all the aspects of these diseases as it effects the individual, giving opinions of his own on some of the mooted questions relating to these infections. The remaining chapters under Part I contain a thorough description and review of leishman bodies and leishmaniasis, trypanosomes and sleeping sickness, intestinal flagellata, amœba, malaria and yellow fever.

Under Part II, there are many chapters devoted to a general consideration of the different kinds of worms, as tapeworms, hookworms, intestinal round worms, trichinæ, filariæ, and their allies. A brief description of the anatomy of these forms is followed by their life histories, their relation to infestation, together with methods of prevention and treatment.

Part III deals with Arthropods or the insects with their allies. Consideration in individual chapters is given to the arthropods in general, the mites, ticks, bedbugs, lice, fleas, mosquitos, book sucking flies, fly maggots and myiasis.

A carefully selected list of references to important articles on parasitology found in different periodicals and books furnishes valuable information, as the closing pages of this important volume, for any one who may desire further detailed knowledge on this subject.

The appearance of this carefully prepared and illustrated volume dealing with parasitology as related to human disease, marks a presentation of this subject in such a manner as to make it readable and useful not only to the parasitologist, but also to the layman and everyone interested in the progress of science and civilization. The work should serve a distinctly useful purpose in the fields for which it was intended.

LOUIS GERSHENFELD

OBITUARY.

CHARLES FORD DARE.

Charles F. Dare was born in Bridgeton, New Jersey, on May 19, 1842, and died suddenly in Newark, N. J., while on a brief visit, on Thursday, May 16, 1918.

Mr. Dare's early life was spent in Bridgeton, his parents moving to Philadelphia when he was young. He received his education in the schools of that city. He entered as an apprentice to the drug business at an early age; attended the Philadelphia College of Pharmacy, passing the examination successfully when less than twenty years of age. Graduating just at the commencement of the Civil War, he at once enlisted in Corn Exchange Regiment of Philadelphia, the regiment being so called from the fact that the Corn Exchange Bank had equipped the regiment at its own expense. Mr. Dare was appointed as hospital steward and remained in that capacity until the regiment was mustered out of the service at the end of the war.

On his return to Philadelphia, Mr. Dare received his diploma from the college, dated March, 1861. In the meantime, his parents had removed to Bridgeton and on his retirement from the Army he came to Bridgeton and was employed in the drug store of Edwin F.

Brewster, where he remained until 1872, when he embarked in business on his own account. This he conducted for several years, and then associated with him a young man in his employ, Harry B. Campbell, under the firm name of Charles F. Dare & Company. After a few years, Mr. Campbell, who was a registered pharmacist, retired from the firm to study dentistry. Mr. Dare then conducted the store alone until about 1890, when, the business having outgrown the old store, he purchased a handsome new building a few doors further down the street and associated with him his son, Charles W., who had graduated from the Philadelphia College of Pharmacy and also became a registered pharmacist, under the firm name of Charles F. Dare and Son, which is so continued at the present time.

Mr. Dare had practically devoted his entire life to the drug business, remaining in active practice until the end, nearly sixty years. He was laid to rest on the anniversary of his birth. Mr. Dare was a careful and competent pharmacist, affable in manner, a man of integrity and a successful business man, a steadfast friend, and an honorable, upright competitor.

Having the respect and confidence of the community, as he held many positions of trust outside of the drug business. He was a member of the board of directors of the Bridgeton National Bank from its foundation in 1883 and for more than thirty years the secretary of the Merchants and Mechanics Building and Loan Association. He was a member of the First Presbyterian Church, and a member of the board of trustees and its treasurer for more than twenty years. He was a member of the Masonic Order and a Past Noble Grand of the Order of Odd Fellows. He was a member of the American Pharmaceutical Association since 1889. He was a member of the New Jersey Pharmaceutical Association, having joined in 1874, and was secretary from 1889 to 1891 and its president in 1895. He was nearly always at the meetings and took an active and earnest part in its work.

His funeral was largely attended by his friends, his associates in the drug business in his home town and from different parts of the state, also by a few comrades from his old regiment.

Mr. Dare was married to Mary Borden, who passed away a few years since. He is survived by one son, Charles W., and a daughter, Mrs. Samuel A. Storey, of New York; two grandchildren, one of whom is named in honor of his grandfather; and two brothers, Isaac, of Camden, and John H., a pharmacist, residing in Bridgeton,

HENRY A. JORDEN.

THE AMERICAN
JOURNAL OF PHARMACY

AUGUST, 1918

EDITORIAL.

DELAYED PUBLICATION.

Printing establishments and editorial offices have not escaped the general demoralization of all business that has resulted from the existing war conditions. The delays have been numerous and at times annoying, yet we realize that these trials are only trifling experiences in comparison with what we may expect and what we are prepared to suffer to enable our country and its allies to win this war. We ask the indulgence of our readers if at times the monthly issues are delayed. They can rest assured that the JOURNAL management is doing its utmost to prevent this.

The demand for space in recent issues has been such that it has been necessary to postpone the publication of a number of accepted articles. The contributors will understand, of course, that under the present conditions it is not feasible to further increase the number of pages in the JOURNAL. In due time, we trust that all of these articles will be published to the satisfaction of our valued contributors, and we thank them for the patience and indulgence shown.

G. M. B.

THE GOVERNMENT IN NEED OF TECHNICALLY TRAINED ASSISTANTS.

In the correspondence column in this number is published a communication from the United States Patent Office calling attention to the need in this department for scientifically educated assistants. We are pleased to devote the space to this purpose and to aid the Federal Departments at all times in the securing of proper advice and assistance.

The need for specially trained examiners in the patent office is conceded. At times, this department has been criticized on account of patents issued without a proper examination of the scientific literature that would have demonstrated the lack of the originality or novelty claimed in the patent application and on which the patent issue was made.

In the December, 1917, number of the AMERICAN JOURNAL OF PHARMACY, editorial comment was made under the title of "The Departments of the Government Need the Advice of the Drug Trade." In this, attention was called to the fact that "many of the rules and regulations promulgated by the federal departments show prima facie a lack of actual knowledge of the industries affected. This is especially true as to the requirements of the drug trade and the prevailing conditions and trade customs under which the supplying of the needs of the inhabitants of the country for medicines and the industries for drug and chemical products has been carried on."

It is our contention that each Department of the Federal Government should have associated an advisory board composed of specialists in the various industries who could advise with the Department as to the appropriateness of the rules and regulations promulgated and the possibilities of legislation affecting these industries.

Under the present war conditions, the government has found it exceedingly valuable to have the advice of specialists in the various industries and manufactures, and there is at all times a corresponding need for such advice on the questions that arise under conditions of peaceful activities as well as the activities of war times.

G. M. B.

THE IMPORTANCE OF THE PHARMACIST TO MANKIND.

In an address delivered at the celebration of the twenty-fifth anniversary of the School of Pharmacy of the Northwestern University in 1911, Dr. Oscar Oldberg, then dean of that School of Pharmacy, made the above title the topic of his address. His exhortation to pharmacists was "I venture to call upon all Pharmacists present to begin here and now a vigorous campaign to compel full recognition of the great service rendered to mankind by the Pharmacist.

Such a campaign is urgently necessary and should have been begun years ago.

The public is ignorant of the fact that the Pharmacist is the sole agent to whom must be entrusted the enforcement of so much of the public health laws as relates to the drugs used in the practice of medicine. Let us try to remove that ignorance.

It is our right and duty to demand respect for the service rendered by our craft."

While much has been accomplished in this campaign of education, the need for its continuance along the lines then advocated by Dr. Oldberg is still very apparent. The opposition to the organization of a pharmaceutical corps in the United States Army demonstrates how little progress has actually been made in the education of the public to the actual relation of pharmacy to medicine and the importance of the service of the pharmacist to mankind.

We are pleased to note that many of the medical journals are now giving consideration to the importance of pharmacy as a collateral branch of medicine, and are advocating the establishment of the army pharmaceutical corps as proposed by the Edmonds Bill, H. R. 5531, so as to relieve the medical officers of the army of a vast amount of non-medical work that has been imposed upon them. The following editorial from the *Pennsylvania Medical Journal,* June, 1918, is a current evidence of this.

RECOGNITION OF PHARMACY.

"Practically every state of the Union has a law which provides that those who furnish drugs to the public shall be qualified for this professional work. In our Army the hospital steward, who dispenses the medicines ordered by the physician for the sick soldier, is detailed from the ranks without requirement of pharmaceutical training.

To remedy this defect and thus increase the efficiency of the Medical Department of the Army, it is proposed to establish a Pharmaceutical Corps. As is the case with the Dental Corps, the Sanitary Corps and the Ambulance Corps, this corps is to be under the command of the Surgeon-General of the Army.

To provide for this recognition of pharmacy, Representative Edmonds of Pennsylvania last July introduced into the House of Representatives a bill to increase the efficiency of the Army, to provide a Pharmaceutical Corps in that department, and to improve the status and efficiency of the pharmacists of the Army. The bill provides for the establishment of a Pharmaceutical Corps to be composed of a pharmacist director, with rank of major, five deputy pharmacist directors, with the rank of captain, and such number of pharmacists, with rank of lieutenant, and of pharmacist apprentices, as may be needed for the service. The bill delegates to the Pharmaceutical Corps the following duties: To procure by purchase or manufacture all supplies of medicines, drugs, chemicals, pharmaceutical apparatus, and hospital and surgical dressings necessary for the Medical Department of the Army; to determine the quality and purity of such supplies; to have charge of the medical supply depots of the Army and the storage and safeguarding of such supplies; to provide for the issuance and distribution of such supplies and the dispensing of medicines in the various hospitals, dispensaries, infirmaries, trains and camps of the Army; to properly care for, regulate the dispensing and to systematically account for all spirituous liquors and habit-forming drugs purchased for the department; to procure by purchase or manufacture such drugs, chemicals, reagents, tests, and biologic products as are used in the laboratories and the medical and surgical practice of the department for the purpose of diagnosis, prophylaxis, or treatment; to account for all moneys received from sales of medical supplies, in accordance with the provisions of the Army regulations or disposed of by order of competent authority; to inspect the department's stores and supplies of drugs, medicines, hospital dressings, reagents, tests and biologic products and determine their deterioration and fitness for use; to coöperate with the other branches of the department in rendering first aid and wound dressing and in the making of diagnostic and chemical tests; to establish and maintain a systematic course of study and training, including the advances made in medicine, pharmacy, and sciences allied thereto, to be pursued by the members of the Army Pharmaceutical Corps who are seeking promotion in the Corps.

It goes without saying that the efficiency of the Medical Department will be increased if trained and experienced pharmacists purchase (or manufacture), test and dispense the drugs selected and prescribed by the medical men. Also, though the pharmacist is not trained to render medical aid nor, except in isolated instances, to do chemical or bacteriologic work, his familiarity with drugs should make him of considerable assistance 'in rendering first aid in wound treatment and the making of diagnostic and chemical tests.' The provision 'to establish and maintain a systematic course of study,' for those seeking promotion, follows the example set by the Army in establishing the Army Medical School, of the Navy in establishing the Naval Medical School and of the United States Public Health Service in providing courses of instruction to the men in the service and should do much to elevate the status of pharmacy.

Altogether the establishment of a Pharmaceutical Corps, through the enactment of the Edmonds Bill or some similar measure, should make for greater efficiency in the Medical Department of the Army. Further, the commercial training of the pharmacist should also make for economy. Thus we feel confident that the director general of the Pharmaceutical Corps would strongly protest against the purchase of the proprietary acetanilid mixture 'Ammonol,' which was included among the medicines in the 'List of Staple Medical and Surgical Supplies,' selected by the Committee on Standardization appointed by the Council of National Defense."

That the public-spirited citizens and business interests of the country are likewise beginning to recognize the important position that pharmacists fill in the organization of society and that the professional services of pharmacists are demanded alike for the soldier and the civilian has also been shown by the following Resolution Adopted by the International Convention of Rotary Clubs recently held at Kansas City.

WHEREAS, We believe that one of the most important duties devolving upon the governmental authorities is to provide to the utmost for the conservation of the lives and health of the American soldiers, who, sacrificnig the comforts of home, are jeopardizing their all for the principles for which the nation is contending, and as our loved ones and, as the soldiers of our country, they are certainly entitled to the very best medical and surgical skill and to expert pharmaceutical service. It is deplorable that in the United States Army medicines are continuously dispensed by those who are unfitted for such duty and who lack a systematic education in the knowledge of drugs and the art of compounding medicines.

WHEREAS, While in civil life each state protects its citizens from incompetent practice, and by law provides for the required experience, education, examination and licensure of those entrusted with the dispensing of medicines, nevertheless the military authorities of the nation ignore the necessity for a like protection for the soldiers and permit potent, and even the most toxic, drugs to be dispensed by incompetent men without any pharmaceutical experience or education. To continue such practice is to continue to invite calamities and to perpetually expose those in the military service to untoward accidents and untimely deaths.

WHEREAS, It is regrettable that the United States with its progressive spirit and commanding position and its enormous resources should in this respect be found lagging and to have a medical department of the army not fully abreast with medical departments of the armies of other nations. In the armies of France, Germany, Austria, Japan, Italy, Spain, Belgium, Holland, Switzerland, Norway, Sweden, and in the colonial armies of Australia and Canada, there are organized pharmaceutical corps with recognized commissions and responsibilities aiding ably the medical officers in safegurading the troops in these armies. The United States, that can well afford to give to the men in her military service the best, should not do less than these other nations; yet we have, at present, no pharmaceutical corps in either the army or navy.

Therefore, It is Resolved by the Ninth Annual Convention of the International Association of Rotary Clubs, that the establishment of a pharmaceutical corps in the United States Army as proposed by Bill H. R. No. 5531, introduced by Hon. George W. Edmonds of Philadelphia, and now pending before the Committee on Military Affairs of the House of Representatives, be endorsed. We urge that the medical department of the army be speedily reorganized to permit of this needed additional safeguard to our soldiers, and to guarantee to the men in the military service the same efficient pharmaceutical service that the States assure in civil life and that is now so generally vouchsafed to the armies of most of the other nations.

G. M. B.

THE COLLECTION OF SPHAGNUM MOSS.

Sphagnum moss is being extensively collected in England and her colonies for use as a surgical dressing. A number of eminent English surgeons and the army medical service have endorsed its use in the present emergency and one eminent surgeon has declared that sphagnum dressing is superior to any cotton dressing and that it has better absorbent qualities.

A number of the pharmacists, especially those in certain sections of Scotland, have aided in this service and their botanical knowledge was highly useful in this connection.

It is stated that all that is necessary is to collect the moss, dry it in convenient clean places and pack it in bags. Sphagnum moss grows so extensively in the marshes, bogs and wet places throughout a very large portion of the United States that its value as a surgical dressing or packing and for other war purposes where cotton, oakum or similar materials are now being used, should be determined and this problem is well worth the investigation of Red Cross and Army Medical authorities. If its usefulness for such purposes can be established an endless supply is available at a nominal cost and in many localities the pharmacists could very well coöperate in the collection, drying and transportation thereof.

CORIARIA MYRTIFOLIA AS AN ADULTERANT OF MARJORAM.[1]

By George M. Beringer, A.M., Ph.M.

From time to time, reports have appeared in technical and scientific literature of the detection of the leaves of *Coriaria myrtifolia* L. as an admixture in various foods and drugs. The adulteration of senna with these leaves was recorded on several occasions during the last century. In recent years the United States Department of Agriculture has several times reported that marjoram containing these leaves had been imported.

La Wall[2] proposed the following method for the separation and estimation of coriaria in marjoram: "by placing a five gramme sample of the suspected drug upon a large sheet of paper and repeatedly shaking and blowing until the lighter particles of marjoram are removed, leaving behind the stems and any sand, dirt, stones, etc., that may be present and the flat, heavier particles of coriaria leaves."

Coriaria myrtifolia L. is one of the characteristic shrubs of the

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[1] Presented in abstract at the meeting of the New Jersey Pharmaceutical Association, Spring Lake, N. J., June, 1918.

[2] Proceedings, Pennsylvania Pharmaceutical Association, 1917, page 241.

Mediterranean flora. Because of the large content of tannin, it has been extensively used at times in the dyeing and tanning industries. Hence the vernacular names commonly applied to the plant, "tannin bush," "leather tree," and "tanner's shrub."

Coriaria myrtifolia has been reported as poisonous to carnivorous animals and the use of the leaves in medicine is negligible. It is stated that all parts of the plant contain the colorless, bitter, crystalline glucoside *coriamyrtin* which is reported as having therapeutic properties resembling in this respect picrotoxin and to be of service in the treatment of blennorrhoea.

The Department of Agriculture has communicated the following rough chemical test for the detection of coriaria leaves in marjoram. "Place about 1 Gm. of the sample in a 6-inch porcelain dish, add 200 Cc. of water and finally about 5 drops of 10 per cent. ferric chloride solution. A light yellowish color of the liquid is produced by pure marjoram, but when coriaria is present the color becomes a decidedly dirty green, the intensity naturally depending upon the amount of coriaria present and the time of standing. The coloration is due to the presence of a large amount of soluble tannin. After standing for a few minutes, the edges of the particles of the coriaria leaves become conspicuously blackened and can be picked out readily."

This proposed test is based upon the well-known reaction of solutions of ferric salts with tannin. Marjoram leaves themselves contain a tannin giving a greenish-black reaction with ferric chloride and many other leaves, such, for example, as those of oak and chestnut, containing notable quantities of tannin would give this reaction equally as well as coriaria leaves, and so this test would have no value for the positive determination of the presence of coriaria leaves.

Recently a sample of marjoram alleged to be adulterated with coriaria was referred to the writer for examination. From this sample a number of small fragments of a foreign leaf were separated. These were quite distinct from the leaves of the marjoram. The fragments showed that the leaf was pale green on both surfaces, without pubescence, and with peculiar wrinkled markings, the texture was thick and the fracture brittle. These fragments were exceedingly small leaf portions, the larger of those it was possible to separate out rarely measuring more than one-eighth of an inch in the longest dimension. So thoroughly had the leaves been broken up that it was impossible to piece the fragment together so as to form any conception of the size or shape of the leaf and no opinion could be formed even as to the character of the margin.

These fragments being smaller and heavier than the most of the portions of the marjoram, the tendency in the bale and in the sample packages was toward the formation of "pockets," in which there would be an undue proportion of these foreign leaf fragments. Hence the attempt to estimate quantitatively the amount of this admixture was abandoned as the results obtained could not be considered as trustworthy.

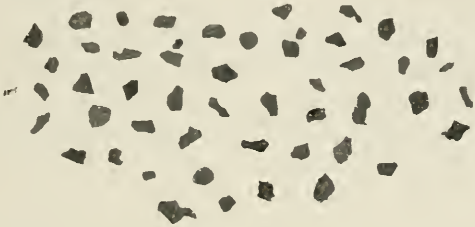

FIG. 1. Fragments of *Coriaria* Leaf, adulterant of Sweet Marjoram.

An attempt was made to trace this particular lot of sweet marjoram back to the source of collection and to obtain samples of the original collection and likewise, of the plants growing in the fields where collected or adjacent thereto, with the hope of thus determining the character and origin of the admixture. It was learned that the lot had been purchased from a New York importer; that it was part of a shipment from Marseilles, France, in January, 1916; that it had been examined and passed at the port of entry on February 24, 1916. The consignors in Marseilles, responded that "it was quite impossible to furnish the information desired and were very sorry not to be able to be of any assistance in the matter."

A critical examination of a number of trade samples of "Sweet Marjoram" convinces the writer that the descriptions in the works on pharmacognosy and food products and, likewise, the definitions in the foreign pharmacopœias for Herba Majoranae must be considered rather as academic utterances than as standards that can be complied with by the commercial marjoram.

The Pharmacopœia Helvetica IV defines Herba Majoranae as the leaves and flowers of *Majorana hortensis* Moench, stripped from the stem at the time of flowering.

The Pharmacopœia Austriaca VIII defines Herba Majoranae as

Majorana hortensis Moench an annual plant indigenous to southern Europe but now generally cultivated. While the description given is for the whole herb, including the stems and branches, this authority likewise admits the cut or "species" form and the coarsely ground.

Practically all of the current botanies and works on foods and drugs attribute sweet marjoram to the herbaceous annual plant *Origanum majorana* L. Karsten separated this from Origanum and reëstablished the genus Majorana of Tournefort and thus the synonymy became more involved as we have in use by different authors for the same plant *Majorana Origanum* L., *Majorana Majorana* Krst., *Majorana hortensis* Mönch.

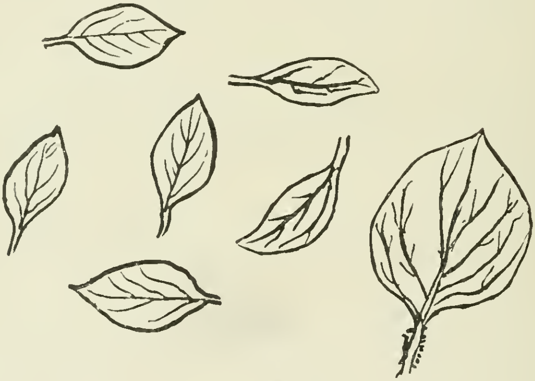

Fig. 2. Typical Leaves of Sweet Marjoram, *Majorana Origanum* L.

Although sweet marjoram has been cultivated as a seasoning herb for many centuries, botanists are far from agreed as to its native country. E. M. Holmes[3] states: "It is supposed to be a native of Mediterranean countries and has been cultivated as a pot herb from the earliest times, being used for this purpose by the ancient Egyptians. It was introduced into this country from North Africa in A.D. 1573, but is hardly known in a truly wild state in Europe, and its native country must be regarded as doubtful."

Due allowance must be made for the changes effected by cultivation and the efforts of the agriculturists and horticulturists with sweet marjoram that have extended over many years. It is known that in many parts of Europe, the annual plant, by cultivation, has been prolonged to several years of growth. The perennial form of marjoram has generally been attributed to *Origanum majoranoides* Willd., which admittedly is very closely allied to *O. majorana* L.

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[3] *The Perfumery and Essential Oil Record,* December, 1912.

Zörnig[4] gives as a "sophistication of true marjoram, *Origanum Maru* L., indigenous to Crete and Palestine and grown by us in the garden as winter marjoram, which has rounded ovate, thick and white hoary leaves."

To whât extent the several above-named species of Origanum contribute to the commercial supplies of sweet marjoram or how far cultivation and hybridization has affected the commercial product remain as unsolved problems. In all of the lots of sweet marjoram that I have examined, there have been noted variations in the flower heads and in the leaves present from the descriptions of the type plant. The sample under consideration in the present investigation was no exception. From this was separated a number of small ovate, thick leaves with appressed white pubescence, that could very readily have been attributed to *Origanum Maru* L. (Fig. 3) and certain elongated cylindrical inflorescences that could have been assigned to *Origanum majoranoides* Willd.

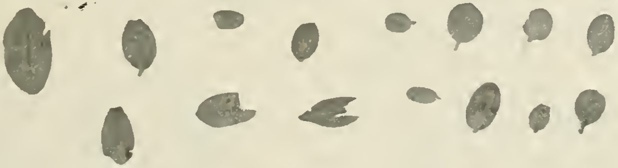

FIG. 3. Leaves of *Labiatae*, with appressed pubescence, occurring with Sweet Marjoram.

Furthermore, an allowable percentage of unavoidable extraneous matter such as grasses and other plants growing with the marjoram and accidentally collected in the harvesting should be officially determined and, likewise, the ash content (varying from 12 to 20 per cent.) should be standardized at not over 15 or 16 per cent.

In a further elaboration of his studies of the marjorams, E. M. Holmes[5] considers *Origanum Maru* L. as the parent plant and states "one of its forms appears to be the parent of the sweet marjoram so widely cultivated in most civilized countries, but the botanical origin of which has hitherto been very obscure." He traces here the historical records and the etymology of the name Marjoram and concludes "that *Origanum majorana* is probably only a form of

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[4] Arzneidrogen, Vol. 1, p. 291.

[5] *The Perfumery and Essential Oil Record,* March, 1913.

O. Maru L.," and he "regards the *Origanum majoranoides* of Willenow as a form of *O. Maru* with stalked leaves and white flowers." He likewise points out as a significant and curious fact "that in our national herbaria only cultivated specimens are to be found under the name of *Origanum majorana* L."

This all tends to confirm the writer's contention that in any official standard that may be adopted for sweet marjoram, due allowance should be made for the botanical uncertainty and for the variations effected by climatic conditions and by cultivation.

In order to arrive at a definite conclusion as to the botanical source of the foreign leaf fragments admixed with this lot of marjoram, and suspected to be coriaria leaves, the investigation had to be confined to a microscopical study of the structure and a comparison of this with the structure of marjoram and of authentic samples of the leaves of *Coriaria myrtifolia.*.

In commercial marjoram many of the leaves are usually broken by the stripping or beating process employed to separate the stems and by the compressing and baling resorted to for transportation.

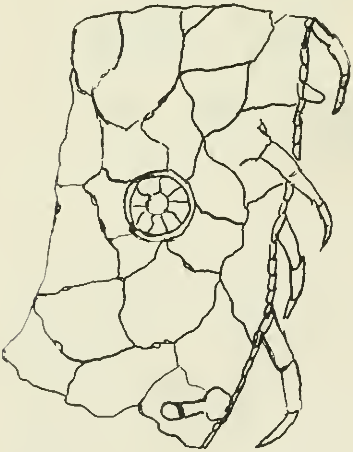

Fig. 4. Upper surface, Sweet Marjoram Leaf.

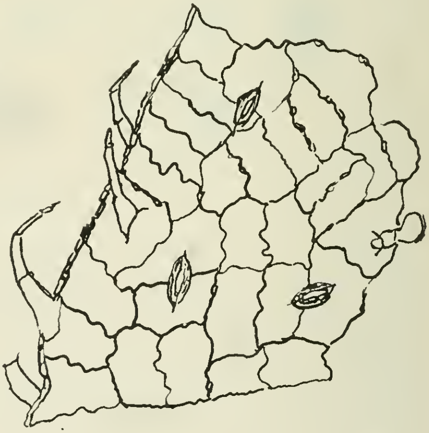

Fig. 5. Lower surface, Sweet Marjoram Leaf.

Nevertheless, by soaking up a small sample a sufficient supply of leaves is generally obtained to permit the study of size, shape and structure and compliance with type specimens.

The lower stem leaves of marjoram are larger, rounded to ovate, with hairy petioles, the upper become smaller, usually ovate to ovate lanceolate, and shorter petiolate, pellucid punctate, midrib prominent, the lateral veins curved unevenly, both surfaces covered with whitish pubescence; bracts ovate to oblong, pubescent.

Under the microscope, the epidermal cells on both surfaces are shown to be strongly sinuate in outline with thickened warty walls, stomata small and more numerous on the lower surface; trichomes on both surfaces abundant and of three distinct types: (1) thin-walled, jointed hairs more or less appressed and bent, (2) stalked hairs with glandular one-cell head, (3) the cup shaped gland with multiple-cell head. Cross section shows that the leaf is bifacial with prominent palisade tissue and comparatively narrow loose mesophyl and no crystal cells. The structural characteristics of sweet marjoram leaf are quite distinctive.

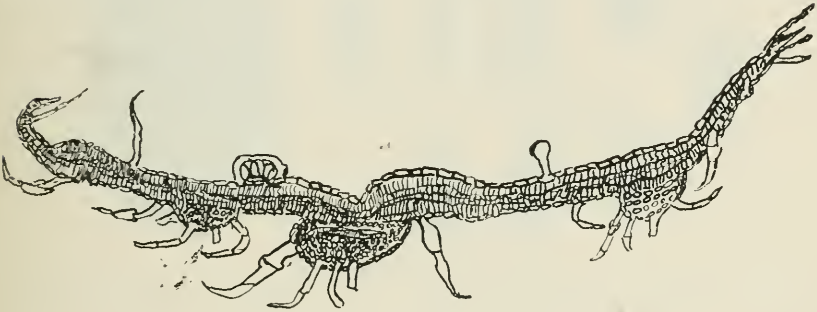

Fig. 6. Cross Section, Sweet Marjoram Leaf.

Coriaria leaves could not be obtained in the drug trade and, under existing war conditions, it was not possible to obtain samples from correspondents abroad. A small sample of "finely cut leaves of *Coriaria myrtifolia*" supplied by the U. S. Department of Agriculture was procured from Prof. Chas. H. LaWall for comparison. The Department had advised him "that they did not have specimens of the entire leaves nor any information as to where they could be obtained." This sample consisted of small leaf fragments that were very similar to those that had been separated from the marjoram under examination and created the suspicion that they likewise had been obtained by isolation from an adulterated importation. In the absence of more definite information as to their source this sample was not accepted as authentic.

Reliable authentic leaves of the *Coriaria myrtifolia* were, however, obtained from the herbarium of the Academy of Natural

Sciences at Philadelphia and from the Martindale herbarium at the Philadelphia College of Pharmacy and I am especially indebted to the latter collection for material which permitted the arrival at a satisfactory conclusion.

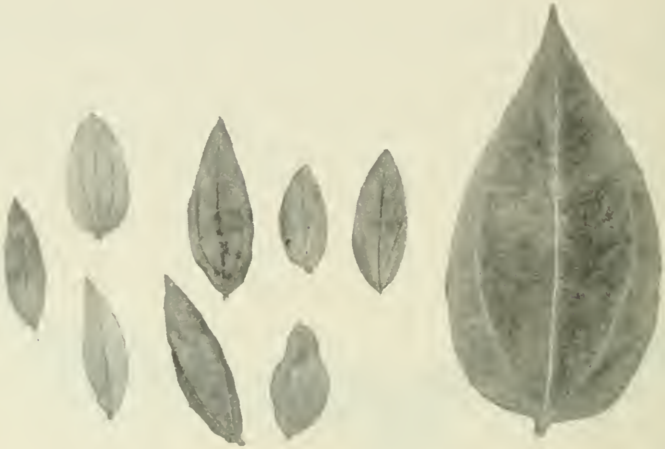

FIG. 7. Leaves of *Coriaria myrtifolia* L. Natural Size. The large leaf is from the specimen *C. angustifolia* referred to in text.

The leaves of *Coriaria myrtifolia* vary from elongated lanceolate to broadly ovate lanceolate or even rhomboid in shape, are glabrous throughout, upper surface bright green, lower pale yellow-green, margin entire. A characteristic is the three prominent veins, the midrib runs to the apex of the leaf and the two lateral veins starting from near the base run nearly parallel to the margin and well past the center of the leaf. Examination shows that the venation is not as simple as it appears at first sight; there are several minor lateral veins starting from the midrib and all of the veins divide and spread fairly well through the lamina so that while there is no apparent anastomizing or reticulation of the surface there is a well-marked venation as shown by Figure 8.

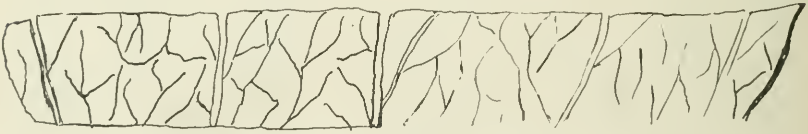

FIG. 8. Venation of *Coriaria myrtifolia* Leaf; × 15.

Under the microscope, the dermal cells appear polygonal in outline, with thickened walls and occasionally distinct pores, with the exception of the stomata and the neighboring cells which are more or less rounded in outline and the neighbor cells are strongly marked or striped perpendicularly to the stomata. The surface is entirely free from hairs or glands of any kind. The stomata are possibly more numerous on the lower surface. The cross section showed a

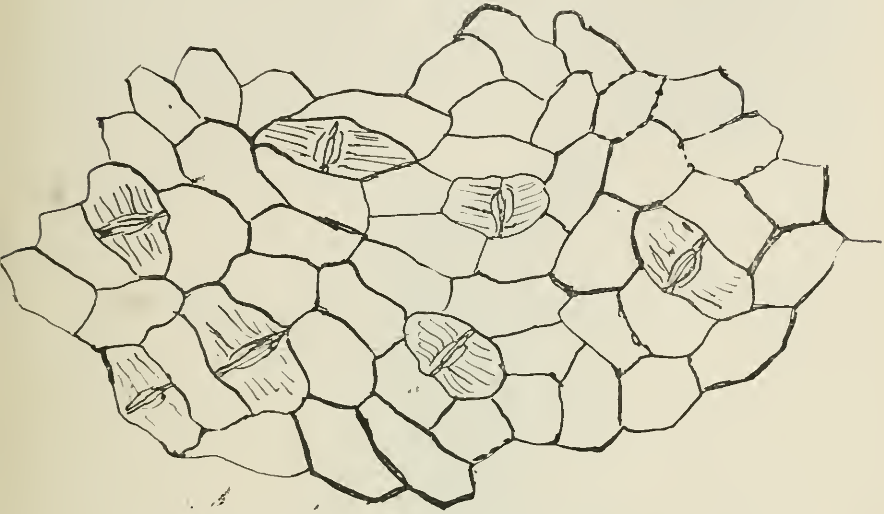

FIG. 9. Stomata and Surface Cells, leaf of *Coriaria myrtifolia.*

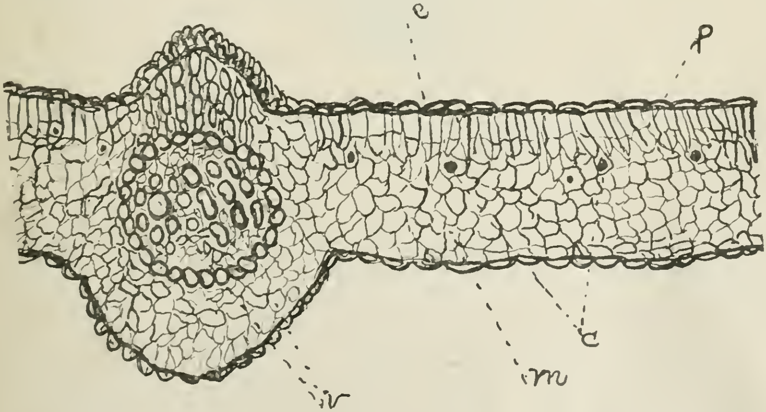

FIG. 10. Cross section leaf of *Coriaria myrtifolia,* × 300. *e,* dermal layer; *c,* oxalate crystals; *m,* mesophyll; *p,* palisade tissue; *v,* vascular tissue of mid rib.

palisade layer beneath the upper epidermal cells of one to three rows deep and beneath this a spongy mesophyll. The upper cells of the mesophyll and the lower cells of the palisade layer contain numerous oxalate crystals. It will be thus seen that coriaria possesses a distinct structure and that the large polygonal cells, the stomata and striped neighbor cells are important as distinguishing histological characters.

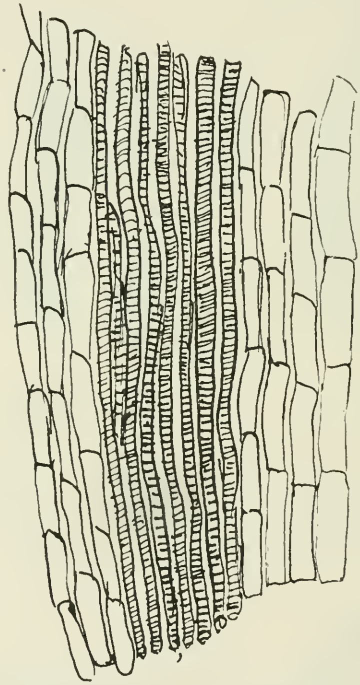

Fig. 11. Longitudinal Section of Midrib of *Coriaria* Leaf; sieve tubes and trachea of the vascular bundle.

The leaf fragments separated from the marjoram showed the glabrous surface, the polygonal cells and the characteristic stomata and stripped cells. They were however somewhat thicker than the leaves of coriaria at first examined and showed in many cross sections never less than two and usually three layers of palisade cells. The majority of the authentic leaves of coriaria examined were thinner and of a softer texture and less wrinkled surface than these fragments and on cross section showed only one or at most two rows of palisade cells.

A specimen discovered in the Martindale herbarium and labeled as "*var. angustifolia*" had thick, broadly ovate to ovate-lanceolate leaves and these had the same wrinkled surface as the fragments and moreover in structure of cross section agreed with these also. This demonstrated not only the variation that occurs in the leaves of *Coriaria myrtifolia* but also permitted a positive conclusion that the leaf fragments separated from the marjoram were portions of the leaves of *Coriaria myrtifolia* so broken up as to destroy any resemblance to their original form.

THE ROMANCE OF THE CHEMICAL ELEMENTS.

Their History and Etymology.

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(*Continued from page 492.*)

Alchemistic Period.

In the alchemistic period there were seven known metals, which were ascribed to celestial bodies. They were always enumerated in a fixed order and designated by the astrological symbols. Thus we have:

○ (1) Sun, gold.
☽ (2) Moon, silver.
☿ (3) Mercurius, mercury.
♀ (4) Venus, copper.
♂ (5) Mars, iron.
♃ (6) Jupiter, tin.
♄ (7) Saturn, lead.

To those came at a later date antimony with the symbol of the earth, ♁.

The era of alchemistry is a very interesting chapter in the history of human knowledge. It was a time when man tried to impress upon nature his petty theories and naturally failed. One can follow step by step the growth of chemical knowledge which finally led to the establishment of physical and chemical laws and taught mankind that the physical world was governed by unchangeable laws, which man cannot alter. Man's position to the physical world was thus altered, and he became an experimenter and investigator, who could only try to find out those physical laws, and apply them to his welfare. While man failed in the achievement of his theory, that of transformation of the base metals into gold, he acquired a great deal of chemical knowledge, which paved the way to the rapid advancement of science in the eighteenth and nineteenth century. The discoveries during the alchemistic period were always accidental, but some of them of great importance for science.

Bismuth.

Among the elements, discovered by some unknown alchemist, is *bismuth,* which is for the first time mentioned by Basil Valentin in 1459 as wismut, and described as a bastard of tin. Paracelsus also speaks of wissmat and in the writings of Georgius Agricola we find it as wissmuth and in the Latinized form bisemutum. According to Koch the name is very probably derived from the Arabic wiss majat, which means a metal that easily melts, for the alchemists studied eagerly the Arabic writings and were familiar with Arabic terms. This explanation is more plausible than the following ones. Kluge, *e. g.,* derives it from the name of the oldest bismuth mine, "St. Georgen in der Wiesen" (near Schneeberg), and connects it with an old miner's term, "muten"—to go prospecting, thus indicating the metal found by prospecting "in der Wiesen." Mathesius tries to connect it with the German "wiesenmatte," and its older form, "wesemot" = a cut meadow, which shall in the late autumn present the different colors sometimes observed on the metal. Sanders finally attempts to explain it as "bi-smut"—bei-schmutz, or dirt, as it should be an impurity of other metals. The last explanations are, however, not plausible. Bismuth or wismuth has been often confused with other metals, so, *e. g.,* in 1595 Libavius holds it as antimony, in 1675 Lemery thinks it to be zinc, until in 1739 J. H. Pott studied its properties and establishes it as an element.

Zinc.

In the form of alloys *zinc* has been used by the ancients, *e. g.,* Aristotle speaks of a metal of the tribe of the Mosynœgy obtained by fusing a natural copper-zinc ore aurichalcite, and Pliny mentions that the mineral kadmia (calamine) is used for making brass. The German word for brass = messing is derived from the ancient tribe name, but the origin of zinc is somewhat obscure. Paracelsus mentions it for the first time in 1520, and as he was deeply interested in medicine may have probably derived it from the old high German "zinco," which means "a white spot in the eye," in allusion to the white color of the metal. It may, however, come from the German zinke = prongu, tine, on account of the pronged, crystalline structure.

Phosphorus.

An important discovery was made in 1669 by Brandt, of Hamburg, who, in his alchemistical experiments, distilled evaporated urine with sand, and found a substance which was glowing. This mysterious substance he called *phosphorus,* in allusion to the morning star Venus, which was often termed Lucifer or Phosphorus, the first name from the Latin lux = light and ferre = carry, the latter from the Greek φος, phos, = light, and φορος, phoros, = bring, both indicating the light-bringing medium. Brandt sold his secret of making phosphorus in 1677 to Krafft, who exhibited specimens of the mysterious substance, but one year later Kunkel, and in 1680 Boyle also found out how phosphorus could be prepared. In 1775 Scheele made it from bones and studied phosphoric acid. Schroetter in 1845 discovered a modification of phosphorus—red phosphorus, and Schenck in 1902 made orange-colored phosphorus.

Cobalt.

Ghosts and goblins played always an important rôle in the minds of the medieval man. They were not only in fairy tales, but actual beings, and inhabited different places. One of these goblins was the German "kobold," which was a spirit of the earth and inhabited underground places. So it was natural that the miners came sometimes in touch with him. One of his deeds was to cause the miners to find heavy ores which looked like silver ores, but which produced no silver and were useless. These ores they termed then kobolt, and we find them mentioned in the writings of the alchemists, Basil Valentin and Georgus Agricola. Then G. Brandt examined these ores and isolated in 1733 a new metal which he called *cobalt* after the mineral.

Platinum.

We come now to the time following the discovery of America, when the Spaniards began to explore the New World and to look there for mysterious treasures. Some of the early adventurers noticed in the gold fields of some southern American districts a white metal associated with gold, which looked like silver, but was not silver, and which they called platina, being the diminutive of the Spanish "plata" silver. Antonio de Ulloa travelling in 1735 in Peru refers in his accounts to this *platinum.* In 1741 some of these grains were brought to England by Charles Wood from the gold mines of Choco in Peru, and in 1750 Sir William Watson described it as a new metal.

Nickel.

Manifold were the dangers to the old miners, for they had not only to encounter bad goblins, but even the devil himself. One of these devilish ores was called by the Germans kupfernickel, for it looked like a copper ore, but on roasting it released poisonous arsenic fumes. So the name given to it was *nickel,* meaning the devil (its milder form in German necken = to annoy, to tease, compare also nickname). It was in 1751 that a Swedish chemist, A. F. Cronstedt, examined this koppernickel and isolated a new metal, which he termed nickel from the mineral.

FOUNDING OF CHEMISTRY.

We come now to the founding of the new chemistry, which was accomplished by the discovery of several gaseous elements, *e. g.,* hydrogen, nitrogen and oxygen. During the previous time the "phlogiston" theory had developed, that is, combustion was thought to be the separation of some element, the phlogiston, from the burning substance, for one could see in the smoke and fumes the phlogiston "going off" and leaving the substance. When oxygen was discovered it was thought to be "dephlogisticated air," chlorine was "dephlogisticated muriatic acid," nitrogen was "mephistic air" or "phlogistic air."

Hydrogen.

The first of these gases to be discovered was *hydrogen,* which was isolated in 1766 by H. Cavendish by the action of acids upon metals, and which he called "inflammable air." Later, in 1781, he showed that by burning of this gas, water was produced and from this fact the name is derived from the Greek ὕδωρ, hydros, = water, and γενναω, gennao, = to produce. There is evidence that the alchemists knew of hydrogen, without examining it closer, for Paracelsus (1493–1541) mentions that a combustible gas is produced by treating certain metals with acids, and in 1700 Lemary recognized knallgas, the explosive mixture of hydrogen and air. Liquid and solid hydrogen was for the first time prepared by Dewar in 1898.

Nitrogen.

In 1772 Rutherford showed that only a part of the air could be used for breathing, and that the remainder could not be used for combustion. This he termed "mephisticated air." Priestley termed it "phlogisticated air," and Cavendish in 1785 produced nitric acid by passing electric sparks through moist air, thus proving that nitric acid can be produced from air. He gave the gas the name *nitrogen,* from niter and gennao, produce, meaning the niter-producing gas (niter = saltpeter or potassium nitrate).

Oxygen.

But the most important of all these discoveries was that of *oxygen,* isolated on the first of August, 1774, by J. Priestley (1733–1804) by heating mercuric oxide. K. W. Scheele (1742–1786), working independently, also isolated in 1775 the gas, which he called "empyreal air," but it was A. L. Lavoisier (1743–1786) who developed the new theory of combustion and termed the gas oxygen, because he found that many of its combustion products were acids, from the Greek ὀξύς, oxy, = sour, and γενναω, gennao, = produce.

Chlorine.

Chlorine was discovered by Scheele in 1774 and called "dephlogisticated muriatic acid." Berthollet in 1784 regarded it as "oxygenized muriatic acid" and in 1809 Sir Henry Davy finally gave it the name chlorine from the Greek χλωρός, chloros, = yellowish green, on account of its color.

Manganese.

The manufacture of glass has been known for a long time; the Egyptians already understood the making of it. Later Byzantium (Constantinople) became the center, and in 1289 the famous glass works of Murano in Venecia were founded. But the raw materials of glass (flint, potash and lime) contained always some traces of iron, which imparted the familiar green color (in bottles) to glass. This green color was destroyed by adding some pyrolusite, a mineral which had already been examined by J. H. Pott, in 1740, who showed that it contained no iron, as was supposed. Scheele in 1775 recognized it as the oxide of a distinct metal which was isolated by J. G. Gahn in 1780 and called *manganese,* from the Greek μαγγάνιζω, manganidso, I purify, in allusion to the use of its dioxide in the manufacturing of glass.

Tellurium.

Another mineral which puzzled the alchemists was called "aurum paradoxum," or "metallum problematum," for it looked like a metal, and did not behave like one. In 1782 Müller von Reichenstein and in 1798 M. H. Klaproth studied this supposed metal, and the latter recognized it as a non-metal and gave it the name *tellurium,* from the Lat. tellus = earth, as it occurs as a mineral.

Tungsten.

Wolfram has been an old German miner's term for a mineral that was "wolfrig"—wolfish, gluttonous in its behavior, for whenever it was melted with tin ores, it looked as if the tin percentage was decreasing. The alchemists gave it the name, for we find in Agricola's writings "spuma lupi" = wolf's stone. In Sweden the mineral was known as *tungsten,* from the Swedish tung = heavy and sten = stone, from which Scheele in 1781 prepared tungstic acid, and in 1783 the brothers d'Elhuyar isolated the metal.

Uranium.

Sir W. Herschel in 1781 discovered a new planet, which was later called uranus from the Greek οὔρανος, uranos, = heaven. This discovery naturally attracted great attention and as M. H. Klaproth in 1789 recognized a new metallic oxide, in pitchblende, he gave it in honor of Herschel the name *uranium.* In 1841 Peligot showed that the supposed metal was in reality the oxide of an element.

Titanium.

Menachin was the name given by William Gregor in 1789 to a new element discovered by him in menachinite (ilmenite). But in 1793 M. H. Klaproth found independently from Gregor in Cornwall a new metal in the mineral rutil, which he termed *titanum,* deriving the name from the Greek halfgods τιτανες, titanes, the children of Uranus and Gae (heaven and earth), in allusion to the element discovered after uranium. The pure metal was very difficult to isolate, but in 1821 Rose prepared a pure titanum oxide and showed that menachin and titanium were identical, while a somewhat impure metal was prepared in 1857 by Wöhler and Sainte-Claire Deville.

Zirconium.

"Jargon de Ceylan" has been known to the French jewellers for a long time as a gem of the hyacinth or jacinth kind. It derived its name from the Hind. cercars, Arab. zargun = stone, meaning the stone from Ceylon. In a variety of it, zircon, M. H. Klaproth recognized a new element, calling it *zirconium;* the metal itself was in 1805 isolated by Berzelius.

Yttria.

In 1788 Arrhenius found near the Swedish town Ytterby a new mineral, which was later called gadolinite, in honor of the Swedish chemist, Gadolin, who discovered in 1794 a new base in this mineral. This base was in 1799 by A. G. Ekeberg called *yttria,* from its occurrence in the mineral of Ytterby. Later on many new elements, the so-called rare earth metals, have been isolated from this and similar minerals, yttria itself proving to consist of several constituents, which will be seen from Table V.

Beryllium.

From beryl L. N. Vauquelin obtained in 1797 a new oxide and in 1828 A. H. Bussy and Wöhler isolated a new metal which was called *beryllium,* from the Greek name beryllos for the gemstone, which was known to the ancients. Sometimes the term *glucinum* is also used for this element, because some of its compounds have a sweet taste (Greek glykos = sweet).

Columbium and Tantalum.

Governor Winthrop of Connecticut found near his house a new mineral which he called columbite, in honor of America. In 1801 C. Hatchett recognized in this mineral a new substance, which he termed *columbium*, and which proved later to be a mixture of columbium and tantalum oxides. In 1802 A. G. Ekeberg isolated from the mineral yttrotantalit from Sweden also a new substance, which proved later to be tantalic acid. But the character of these new substances was not recognized until in 1844 Rose isolated from a columbite of Bavaria two new elements, which he termed "niobium" and "pelopium," from the Greek Niobe, the daughter, and Pelops, the son of Tantalus, as it was supposed that these elements were always associated with *tantalum*. R. Hermann also isolated two elements, which he called "ilmenium" and "neptunium," from the mineral ilmenite and the newly discovered planet Neptune. But his elements proved later to be a mixture of columbium and tantalum. The separation of these elements was very difficult, and to-day we recognize columbium (or niobium) and tantalum (or pelopium). The name tantalum was given to it in allusion to the Tantalus in the Greek legend, the son of Zeus, king of Lydia, who was punished by standing in water, with beautiful fruit trees above him. His thirst he could not still, for the water retreated before his mouth, and the fruits were always just out of reach. According to the early ideas about tantalum, it was unable to "satisfy" its thirst for acids, for it could not be neutralized with acids, even by an excess of it. But its isolation and separation was also tantalizing, and its evasive nature justifies the name from more than one standpoint.

Platinum Metals.

The platinum ore, respectively native platinum, was examined by Smithson Tennant and independently by Wollaston in 1804, and each of them discovered two new metals: *osmium* and *iridium* by the former and *palladium* and *rhodium* by the latter. The names are derived from the Greek terms of some of their properties, while palladium is named in honor of the newly discovered asteroid Pallas (see Table VI).

Ceria.

Another new planet was discovered in 1801 by Piazzi of Palermo, which was the first one of the asteroids, and called Ceres; from it the name cerite for a new mineral and *ceria* for a new base found by Klaproth and independently by Berzelius and Hisinger in 1803 has been derived. Like yttria, so ceria proved to consist of several other elements of the rare earth group, whose separation and isolation is seen in Table IV.

Sodium and Potassium.

The salts of *sodium* and *potassium* have been known in very remote times and used in various trades. The Egyptians already distinguished between "ordinary alkali" and "red alkali," the latter being potassium carbonate, which colored the flame purple. In the Orient sodium carbonate (and potassium carbonate) was known as neter or bor, and it was mainly gotten from the alkali lakes of Egypt, about fifty miles from Cairo. In the Old Testament we find (perhaps the first reaction) that nether and vinegar mixed together are effervescing. The Romans imported large amounts of nitrum (sodium carbonate) from Egypt and used it for the manufacturing of soap. From nitrum the modern terms natrium (sodium) and niter (saltpeter) are derived. The term alkali came in use among the alchemists, and is derived from the Arabic article al and kali = ash, for alkali or potash was prepared by burning of seaweeds and other plants. From it kalium (potassium) is derived. The Arabic kali = ash is connected with kalaja = to burn, and is also found in Hebrew kalah = burning. Marggraf in 1758 showed the analytical distinction of sodium and potassium and in 1807 Sir H. Davy succeeded in isolating the metals by electrolysis, thus introducing electric methods into chemistry and laying the foundation for electrochemistry.

Calcium and Magnesium.

Like sodium and potassium, so *calcium* and *magnesium* were first isolated by electrolytical means. Calcium by Davy in 1808, and magnesium in 1830 by Liebig and Bussy, although Davy had tried in vain to prepare it. The compounds of calcium were known in prehistoric time; we have in Latin calx, Greek chalix for limestone and chalk (compare calcareous and the German kalk, Swedish kalck, even the French chaux).

Magnesium sulphate was known as epsom salt to N. Grew in 1695, who prepared it, and magnesium alba was made in 1707 by M. N. Valentin, while in 1755 J. Black showed that magnesium alba and lime were different substances. The name was derived from magnesite, a mineral found near the ancient town of Magnesia (modern Manisa) in Asia Minor.

Between 1800 and 1850 not less than twenty-three elements were discovered or isolated, mainly by the experimental work of Davy, Gay-Lussac, Berzelius, Wöhler and others. It was during this time that the methods of chemistry were worked out and the foundation of the science established. From Table VIII the results of their work can be seen.

The Spectroscope.

The new science was aided in 1860 by the application of spectroscopic methods to analysis, and as a result several new elements were discovered by this method. The first one was *cæsium,* whose presence was detected by the "fathers" of spectroscopy, Robert Bunsen and Kirchhoff, *rubidium* followed right after, then *thallium* by Crookes, *indium* by Richter, *gallium* by Lecoq de Boisbaudran. The names were mostly derived from the Greek words for the color of characteristic lines in the spectrum (see Tablle III).

The spectroscope was then employed as an aid in the separation of the rare earths, and many "new" elements were found, which proved later not to be so. But some were really new, and are embodied in our present list of elements (see Tables IV and V).

Periodic System.

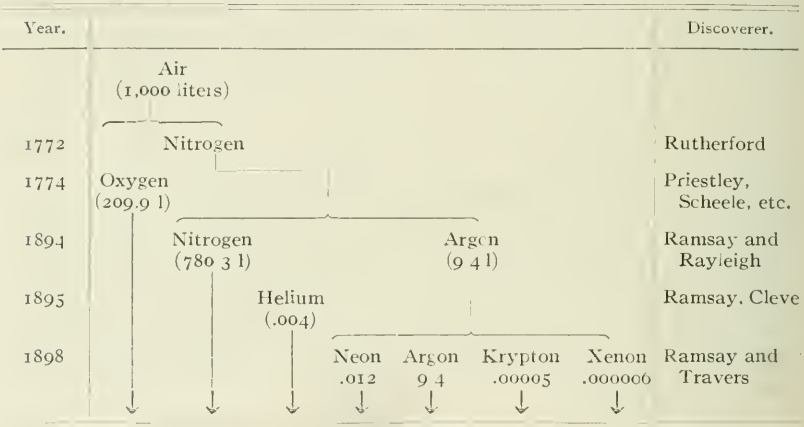
The rapid discovery of a great many new elements stimulated not only the study of chemistry and made it more popular, but it also enabled the chemist to systemize and compare his results. In every science we can follow the gradual development from collecting facts to systematization. So we find the first attempts of a classification in 1829 as Doebereiner published his "triads," that is, he put always three elements into a group, in which there was a certain relation of their properties (*e. g.,* Li-Na-K; Ca-Sr-Ba; S-Se-Te; etc.). This idea was further developed in 1854 by Crookes, and in 1865 by DeChancourtois. In the same year the important step of increasing the groups was taken by Newlands in his law of "octaves," grouping eight elements together. Then in 1869 came Mendeleeff and independently Lothar Meyer and announced their periodic system. It is often said, in textbooks and otherwise, that the periodic system was "discovered." But this is misleading, as something that gradually develops with the increasing knowledge of mankind is not "suddenly discovered," but is "gradually attained." But Mendeleeff discovered something, and that was the prediction of two new elements. He thought, presuming the system was correct and assuming there is a unity and persistency in the material world, that some elements were missing, and he calculated from their assumed position the properties they should have and called them, in 1869, eka-boron and eka-silicon. Six years later *gallium* was discovered by Lecoq de Boisbaudran and its properties proved to be those of eka-boron. In 1886, Clemens Winkler found a new constituent in argyrodite of Freiberg and termed it *germanium,* and its properties were identical with those predicted by Mendeleeff, as eka-silicon. These predictions could only be made because the elements were near those elements of lower atomic weights, and filled out the table practically complete. To-day we are enabled to fix the end point of the elemental series, viz., the radioactive elements, and thus limit the system to 92 elements.

Noble Gases.

Throughout the modern development of chemistry it has been believed that we know exactly the constitution of air and its percentage of different gases: oxygen, nitrogen, carbon dioxide, water vapor, etc. The announcement of Sir William Ramsay and Lord Rayleigh in 1894 that they had discovered a new gas in the atmosphere, was therefore generally accepted as very doubtful. But there came more, for not only *argon,* but in 1898 *neon, krypton, xenon,* and later *helium,* were found to be constituents of air. The percentage is very small, and the methods employed for determining it are a triumph of physics. These new gases developed to be elements, although it was at first proposed by some chemists that argon might be only a different form of nitrogen, just like ozone is oxygen gas containing three atoms in the molecule. They were elements, but no compound could be made; all means to produce a chemical reaction with these elements failed. In fact the name argon, from the Greek term for lazy, indicates its inertness. The difficulty arose how to place these elements in the periodic system, and a "zero" group was added. Now we know that these elements form, so to speak, the "missing link" in the system, for they form the transition from a highly electro-negative group of elements to a highly electro-positive group. From the halogens to the alkali metals. So they became of great theoretical importance in chemistry.

TABLE VII.

The Family Tree of the Noble or Inert Gases.



Number	8	7	2	10	18	36	54
Symbol	O	N	He	Ne	A	Kr	Xe
At. W.	16	14	4	20	40	83	130

N. B. The amount of each gas by volume is given in parenthesis. Thus 1,000 liters of air contain about 0.004 liters of helium, etc.

Radioactive Substances.

Following this epoch-making discovery there came another one of equal, perhaps still greater importance, namely, the radio-active substances. The time was ripe and the stage set for this discovery. It came after physics had settled down and declared that there could no more be anything new in physics, and that the work of the physicist simply consisted in working out the details. Then came the discovery of the X-rays by Professor Röntgen, and with it an entirely new field had been opened up. Everyone began to work with "rays" of some kind or other. Becquerel in Paris studied especially the rays emitted from uranium salts, and this led to the discovery of *polonium* and *radium* by Professor and Madame Curie in 1898. Then followed a time of great confusion, for everywhere new radioactive substances were discovered. But the mystery was increased when it was found that these bodies disappear. For instance Madame Curie had separated with much care and time a little sample of polonium and sealed it into a small glass, and put it aside. After half a year, when she wanted to use it again, it was gone. That is the glass was there all right, but the polonium had left.

Many experiments have been carried on, and many ingenious devices have been invented and as a result of the new phenomena, such as radioactivity, cathode rays, X-rays, etc., we have been forced to change our conception of an atom. For practical purposes an element still consists of atoms, but these atoms are also built up of still smaller particles, of which the electrons and the alpha-particles (which change into the element helium) have already been isolated. Our atomic theory is still in the process of being created, and the reader is more or less familiar with the tendencies of modern physics (or is it chemistry?).

We have in this way followed the history of the elements, and in Table VIII the reader will find a chronological arrangement. This and the other tables will serve as a reference, for the space of the text permitted the writer to mention only some and not all of the elements. A careful study of these tables will be helpful to understand certain movements in the history of chemistry. For instance how the introduction of electrolysis and the spectroscope resulted in the discovery of some new elements, and how the knowledge of about 60 elements assisted in the formulation of the periodic system, for these 60 elements were the important nucleus of the system. To-day the study of the periodic relationship among the elements will help us to solve our present problem: the constitution of the atom, for we have now with the noble gases a continuous line of elements, while the radioactive elements indicate the end of the line, so that we are entitled to believe our system to be complete.

The romance of the chemical elements is fascinating, and while I am doubtful if I have made the subject interesting to the reader, I will be satisfied if I succeeded in pointing out how knowledge grows, and how, by the labors of our ancestors, we are enabled to lift the veil of the mysteries of nature and apply the natural laws for the welfare of mankind.

TABLE VIII.

Chronological Order of Discovery of the Chemical Elements.

Year.	Name.	Discoverer.	Source.
Prehistoric	Carbon		Native
“	Sulphur		Native
“	Gold		Native
“	Silver		Native
4000 B. C.	Copper	(Egypt)	(Mt. Sinai)
3500 B. C.	Iron		Meteorites
	Lead		
1600 B. C.	Tin	(Chaldaea)	
1000 B. C.	Antimony		
300 B. C.	Mercury	Theophrastus	Cinnabar
Alchemistic Period:			
1220	Arsenic	Albertus Magnus	Orpiment
1459	Bismuth	Basil Valentin	
1520	Zinc	Paracelsus	Zincblende
1669	Phosphorus	Brandt	Urine
Beginnings of Chemistry:			
1733	Cobalt	Brand	Cobalt ore
1750	Platinum	Wood, Watson	Platina
1751	Nickel	Cronstedt	Kupfernickel
1758	Sodium	Marggraf	Sodium salts
1758	Potassium	Marggraf	Potassium salts
Founding of Chemistry:			
1766	Hydrogen	Cavendish	Acids
1772	Nitrogen	Rutherford	Air
1774	Oxygen	Priestley	Mercuric oxide
“	Chlorine	Scheele	Muriatic acid
“	Magnese	Scheele	Pyrolusite
“	Barium	Scheele	Baryte
1782	Tellurium	Müller	“Aurum paradoxum”
“	Molybdenum	Hjelm	Molybdenite
1783	Tungsten	d'Elhujar	Scheelite
1787	Strontium	Cruikshank	Strontianite
1789	Zirconium	Klaproth	Zircon
“	Uranium	Klaproth	Pitchblende
“	Titanium	Gregor	Ilmenite
1794	Yttrium	Gadolin	Gadolinite
1797	Chromium	Vauquelin	Crocosite
“	Beryllium	Vauquelin	Beryl
1801	Columbium	Hatchett	Columbite
1802	Tantalum	Ekeberg	Yttrotantalite
1803	Cerium	Klaproth	Cerite
“	Osmium	Tennant	Platinum
1804	Iridium	Tennant	Platinum
“	Palladium	Wollaston	Platinum
“	Rhodium	Wollaston	Platinum
Beginnings of Electrochemistry:			
1808	Calcium	Davy	Lime
“	Magnesium	Davy	Magnesia alba
“	Boron	Davy, Thenard, etc.	Borax
1812	Iodine	Courtois	Sea-kelp
1817	Selenium	Berzelius	Chamberdeposits

TABLE 8.—*Continued.*

Year.	Name.	Discoverer.	Source.
Beginnings of Electrochemistry:			
1817	Cadmium	Strohmeyer, Herman	Zincblende
1823	Silicon	Berzelius	Flint quartz
1826	Bromine	Balard	Sea-water
1827	Aluminum	Wöhler	Alum
1828	Thorium	Berzelius	Thorite
1830	Vanadium	Sefström	Iron slag
1839	Lanthanum	Mosander	Cerite
1841	(Didymium)	Mosander	Cerite
1843	Erbia	Mosander	Cerite
1845	Ruthenium	Claus	Platina
Beginnings of Spectroscopy:			
1860	Caesium	Bunsen	Mineral water
1861	Rubidium	Bunsen	Mineral water
"	Thallium	Crookes	Chamber deposits
1863	Indium	Reich, Richter	Zincblende
1875	Gallium	Lecoq de Boisbaudran	Zincblende
1878	Terbia	Delafontaine	Cerium minerals
"	Ytterbia	Mariqnac	Cerium minerals
"	Holmium	Soret	Cerium minerals
"	Thulium	Cleve	Cerium minerals
1879	Samarium	Lecoq de Boisbaudran	Samarscite
"	Scandium	Nilson	Cerite
1880	Gadolinium	Mariqnac	Samarscite
1886	Dysprosium	Lecoq de Boisbaudran	Holmia
"	Praseodym	Auer von Welsbach	Didymia
"	Neodym	Auer von Welsbach	Didymia
"	Germanium	Winkler	Argyrodite
"	Fluorine	Moissan	Hydrofluoric acid
Modern Chemistry:			
1894	Argon	Ramsay & Rayleigh	Air
1895	Helium	Cleve, Ramsay	Cleveite, uranie
1898	Neon	Ramsay & Travers	Air
"	Krypton	Ramsay & Travers	Air
"	Xenon	Ramsay & Travers	Air
"	Polonium	Curie	
"	Radium	Curie, Bemont, Schmidt	Pitchblende
"	Actinium	Debierne, Giesel	Thorium ores
1900	Europium	Demarcay	Samarium
1907	Lutecium	Urbain	Ytterbium
1913	Brevium	Fajans	Uranium
1916	Denebium	Eder	Thulium
"	Dubhium	Eder	Thulium

THE RELATIVE ACTIVITY OF SEPARATED PORTIONS OF DIGITALIS.

By E. L. Newcomb and C. H. Rogers.

In a previous paper a method was presented for the special cleaning of the drug digitalis. The digitalis used for the development of the special cleaning process was prepared from plants of *Digitalis purpurea,* first year's growth, grown in the Medicinal Plant Gardens of the College of Pharmacy of the University of Minnesota. The drug met all U. S. P. IX requirements without the application of the special cleaning process. However, in view of the lack of information concerning the nature of foreign matter which the U. S. P. permits to be present it was deemed wise to carry the process of eliminating this extraneous material just as far as possible and thereby produce a drug with a minimum of what are possibly deleterious substances.

During the special cleaning process the digitalis was separated into four well-defined portions, *i. e.,* (*a*) select clean drug representing petiole and lamina only, ash 9.284 per cent.; (*b*) select clean drug with petioles partly removed, ash 8.91 per cent.; and (*c*) petiole fragments with practically no lamina present, ash 8.76 per cent.; and (*d*) number 50 fine powder siftings consisting of the hairs of digitalis, inorganic material and very few lamina and petiole portions, ash 56.81 per cent.

As the work of cleaning progressed a number of questions arose which demanded the application of physiologic methods for their solution and this further study, with the results obtained, is herewith presented.

One of the important questions to be determined was the relative activity of the several separated portions. These values were determined by the application of the following well-known methods for the physiological assay of digitalis: (*a*) Reed and Vanderkleed guinea-pig method, (*b*) intravenous cat methods. It is not our purpose to discuss in this paper the relative merits of the methods employed although the nature of the work and the results obtained causes us to give preference to the latter.

A five per cent. infusion of the select cleaned digitalis representing petiole and lamina was prepared, and upon assay by the guinea-pig method gave the following results:

TABLE I.

Guinea-pig Assay of Select Cleaned Digitalis—Five Per Cent. Infusion.

Date of Test.	Pig Number.	Weight of Pig.	Dose of Drug in Gm. per 250 Gm. Wt. of Pig.	Dose of Drug in Gm. per Gm. Wt. of Pig.	Actual Dose Given in Mls. of 5% Infusion.	Results.
2–4–18, 12:10 A.M.	3	405	.0875	.00035	2.835	Died 12:43 A.M., 33 min.
2–4–18, 12:15 A.M.	4	390	.0875	.00035	2.73	Died 12:53 A.M., 38 min.
2–3–18, 11:15 P.M.	1	535	.075	.0003	3.21	Died, 2–4–18, 12:52 A.M., 57 min.
2–4–18, 12:05 A.M.	2	500	.075	.0003	3.00	Died 12:05 A.M., 1 hr.
2–4–18, 10:10 P.M.	10	400	.0625	.00025	2.00	Died 11:30 P.M., 1 hr. 20 min.
2–4–18, 10:05 P.M.	9	750	.050	.0002	3.00	Died, 2–5–18, 12:20 A.M., 2 hrs. 15 min.
2–5–18, 2:30 P.M.	16	640	.04375	.000175*	2.24	Died 4:30 P.M., 2 hrs.
2–5–18, 5:15 P.M.	18†	495	.04375	.000175*	1.73	Died 7:20 P.M., 2 hrs. 5 min.
2–15–18, 5:40 P.M.	35	420	.04375	.000175*	1.47	Recovered
2–5–18, 2:20 P.M.	15	630	.0375	.00015	1.89	Died 4:30 P.M., 2 hrs. 10 min.
2–5–18, 5:07 P.M.	17†	390	.0375	.00015	1.17	Survived 36 hrs.
2–15–18, 5:43 P.M.	36	405	.0375	.00015	1.215	Recovered
2–5–18, 6:00 P.M.	19	720	.03125	.000125	1.80	Recovered
2–5–18, 6:05 P.M.	20	575	.025	.00010	1.15	Recovered

A ten per cent. infusion of the petioles separated from the select clean digitalis was made and tested by the guinea-pig method, with the following results:

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* M. L. D. is .04375 Gm. of select clean digitalis per 250 Gm. wt. of guinea-pig, or .000175 Gm. per Gm. wt. of pig.

† Infusion prepared from capsule-filling drug, petioles partly removed.

Note: The word "cleaned" as used in the title of this table refers to drug prepared by the special cleaning process, outlined by the authors in a previous paper.

TABLE II.

Guinea-pig Assay of Petioles Separated from Select Cleaned Digitalis—Ten Per Cent. Infusion.

Date and Time of Test.	No. of Pig.	Weight of Pig.	Dose of Drug in Gm. per 250 Gm. Wt. of Pig.	Dose of Drug in Gm. per Gm. Wt. of Pig.	Actual Dose Given in Mls. of 10 % Inf.	Results.
2-4-18, 1:05 A.M.	7	575	.4	.0016	9.2	Died, 2-4-18, 1:45 A.M., 40 min.
2-4-18, 10:30 P.M.	13	335	.3	.0012	4.02	Died, 2-5-18, 12:30 A.M., 2 hrs.
2-4-18, 10:35 P.M.	14	390	.25	.00010	3.9	Died, 2-5-18, 12 M., 13 hrs. 25 min.
3-27-18, 4:15 P.M.	50*	355	.25	.0010	3.55	Died, 3-28-18, 8:25 A.M., 16 hrs. 10 min.
4-18-18, 2:46 A.M.	60*	205	.2375	.00095	1.94	Died, 4-19-18, 12:00 P.M., 33 hrs.
4-18-18, 2:44 A.M.	59*	260	.2375	.00095	2.47	Died, 4-18-18, 9:00 A.M., 6 hrs. 16 min.
4-18-18, 2:41 A.M.	58*	560	.2250	.0009†	5.04	Died, 4-18-18, 9:00 A.M., 6 hrs. 16 min.
4-18-18, 2:38 A.M.	57*	540	.2250	.0009†	4.86	Died, 4-18-18, 9:00 A.M., 6 hrs. 16 min.
4-18-18, 2:35 A.M.	56*	310	.2125	.00085	2.63	Recovered
4-18-18, 2:30 A.M.	55*	320	.2125	.00085	2.72	Recovered
4-18-18, 2:25 A.M.	54*	435	.2	.0008	3.48	Recovered
2-4-18, 1:15 A.M.	8	380	.2	.0008	3.04	Recovered
3-27-18, 4:05 P.M.	45	350	.2	.0008	2.8	Recovered
3-27-18, 4:11 P.M.	49*	375	.2	.0008	3.00	Recovered
3-28-18, 9:35 P.M.	51*	260	.2	.0008	2.08	Recovered
3-27-18, 4:07 P.M.	48*	440	.175	.0007	3.08	Died, 3-27-18, 7:30 P.M., 3 hrs. 23 min.
3-28-18, 9:40 P.M.	52*	475	.175	.0007	3.325	Recovered
3-28-18, 9:45 P.M.	53*	180	.175	.0007	1.26	Recovered

A ten per cent. infusion of the number 50 siftings which ran 56.81 per cent. of ash was prepared and also tested by the guinea-pig method. The results were as follows:

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* The 10 per cent. infusion used for these pigs was prepared from petioles rolled between the fingers in order to free them from about 5 per cent. of laminar portions.

† M. L. D. is .225 Gm. of petiole per 250 Gm. wt. of guinea-pig, or .0009 of petiole per Gm. wt. of pig.

TABLE III.

Guinea-pig Assay of No. 50 Dirt Siftings Separated During the Process of Cleaning Digitalis—Ten Per Cent. Infusion.

Date and Time of Test.	No. of Pig.	Weight of Pig.	Dose of Drug in Gm. per 250 Gm. Wt. of Pig.	Dose of Drug in Gm. per Gm. Wt. of Pig.	Actual Dose Given in Mils of 10% Infusion.	Results.
2-4-18. 12:50 A.M.	6	545	·4	.0016	8.72	Died 2-4-18, 9:00 A.M. 8 hrs.
2-4-18, 10:18 P.M.	11	445	·3	.0012	5·34	Died 2-5-18, 4:30 P.M. 18 hrs. 12 min.
2-4-18, 10:25 P.M.	12	370	.25	.0010	3·7	Died 2-5-18, 1:05 P.M. 14 hrs. 40 min.
2-4-18, 12:40 A.M.	5	467	.2*	.0008*	3·736	Died 2-4-18, 11:50 P.M. 33 hrs. 10 min.
3-27-18, 4:20 P.M.	46	375	.175	.0007	2.625	Recovered
3-27-18, 4:25 P.M.	47	355	.15	.0006	2.13	Recovered

According to Reed and Vanderkleed the standard M. L. D. for digitalis is 100 milligrammes of drug per 250 gramme body weight of guinea pig, with a twenty-four-hour limit. Table I shows that the M. L. D. of the select cleaned Minnesota digitalis was 43·75 milligrammes of drug per 250 gramme body weight of animal. In other words, the drug proved to be more than twice as active as required by the arbitrary standard of Reed and Vanderkleed, which is in conformity with results on previous years' crops of Minnesota digitalis when tested by this method. This table also shows that the activity of the drug from which the petioles had been partly removed was practically the same as that of the entire leaf.

Table II clearly indicates that the petioles of digitalis contain a comparatively small amount of the active principles of the drug. The M. L. D. was 225 milligrammes of petioles per 250 gramme body weight of pig. The petioles, therefore, were only about one fifth as active as the cleaned drug, and two fifths as active as the arbitrary standard requirement. Post-mortem examinations showed the hearts to be systolic. The pigs which died exhibited the usual symptoms caused by toxic doses of digitalis. The removed petioles constituted about sixteen per cent. of the total weight of the drug worked with and considering their low activity their removal would only slightly increase the activity of the remaining drug. Theoretically the activity of the drug with petioles partly removed was increased about four per cent. This increase of activity, however, was not detected by the guinea-pig test.

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* M. L. D. is .2 Gm. of No. 50 dirt siftings per 250 Gm. wt. of guinea-pig, or .0008 Gm. per Gm. wt. of guinea-pig.

The presence of only a small amount of the active principles of digitalis in the petioles should be of special interest to students of phyto-chemistry and plant physiology. The tissue of the petiole is chiefly parenchymatous and deficient in the essential elements of photosynthetic activity. On the other hand, the lamina portion of the leaf is composed primarily of cells which are rich in plastid elements, and it is here that the glucosides of digitalis are most abundant. These observations would indicate that the formation of the glucosides of digitalis is closely associated with photosynthetic activity in the leaf. From work now in progress we hope to soon present data concerning the time in the growth of the plant when the glucosides of digitalis first make their appearance.

Table III is especially interesting in that it shows that the number 50 dirt siftings which previously had given a negative chemical reaction for digitalis glucosides possessed marked physiologic properties. The M. L. D. was 200 milligrammes of siftings per 250 gramme body weight of pig. The siftings therefore were only about one fourth as active as the cleaned drug or about one half as active as the standard. Post-mortem examinations revealed the hearts to be systolic. The animals were under more or less constant observation during the period of the test and exhibited symptoms which were not characteristic of digitalis. There was the usual loss of muscular coördination, but this was accompanied by frequent spasms of superexcitation. The spasms were rapid clonic and began in cases of the pigs receiving the larger doses shortly after the administration of the drug. Opisthotonos was pronounced shortly after the spasms began. The rapid contractions and relaxations of the extremities continued at intervals, although the back remained in the arched position until death. Chemical and physiological examinations having demonstrated the presence of only a small amount of digitalis glucosides in the dirt siftings, it is logical to assume that the unusual symptoms manifest were due either to (*a*) water-soluble constituents of the hairs of digitalis which were present in the siftings in large numbers, or (*b*) physiologically active principles of the foreign matter present, or (*c*) a possible combination of effects. In any event it seems to us that these observations afford a strong argument for a more stringent requirement for the careful garbling and thorough cleaning of digitalis leaves.

Table III further demonstrates that the hairs of digitalis are practically devoid of glucosidal principles. This is further substantiated by the fact that a microscopical examination of the fine siftings revealed the characteristic hairs of digitalis as by far the larger portion of all tissue present. Again no qualitative glucosidal test could be obtained from an infusion of this sample.

Tables IV, V, VI give in detail the results of the further examination of the three separated portions, *i. e.*, (*a*) select cleaned digitalis, (*b*) petioles, and (*c*) number 50 dirt siftings. These portions were examined by a modification of the Hatcher Ouabain Method suggested by Hatcher and used by Rowntree and Macht. A M. L. D. of 100 milligrammes of drug per kilogramme of cat, injected intravenously, is generally accepted as the average lethal dose for digitalis. Table IV shows that the cat unit when examined by the method above mentioned is equal to 87.62 milligrammes of select cleaned digitalis leaves, which is 12.38 per cent. more toxic than the average drug. Obviously it is impractical to compare the relative value of the clean digitalis as determined by the guinea pig and cat methods of assay unless the respective standards have a known relative value. It is our opinion that .2 milligrammes of digitalis per gramme of guinea pig is the approximate equivalent of 100 milligrammes per Kg. of cat. Our results show that .175 milligramme of drug per gramme of guinea pig represents the approximate equivalent of 87.62 milligrammes of drug per Kg. of cat. On this basis both methods of assay indicate that the specially cleaned Minnesota digitalis was about 12 per cent. more active than the average sample of digitalis.

A comparison of the results presented in Table IV with those shown in Table V indicates that the petioles were about one fourth as active as the cleaned drug. This is in close accordance with the results obtained by the guinea-pig method.

Table VI relates to the examination of the fine dirt siftings the same as reported upon by the guinea-pig method in Table III. While the results seem to be somewhat discordant, in general they corroborate with Table III. Eliminating cats number one, six, three and seven, the variation is not more than would be expected considering the unusual symptoms exhibited by the guinea pigs, and the exceptional symptoms which were also evidenced in the cats. All the cats exhibited marked peristalsis, defagation taking place in three of the animals. With one exception the cats showed the usual decrease in

TABLE IV.

Intravenous Cat Method Assay of Select Cleaned Digitalis—One Per Cent. Infusion.

Date and Time of Test.	No. of Cat.	Sex Wt. in Kg.	Mils of 1% Inf. Used.	Mils Used per Kg.	Mgs. of Drug per Kg.	Time in Minutes.
4-1-18, 3:54 P.M.	1	2.825 M.	23	8.141	81.41	36
4-1-18, 4:54 P.M.	2	2.675 F.*	19.5	7.289	72.89	30
4-1-18, 7:30 P.M.	3	2.685 M.	26	9.683	96.83	42
4-1-18, 8:35 P.M.	4	2.575 M.	14.1	8.952	89.52	18
4-1-18, 9:12 P.M.	5	2.155 M.	17.4	8.074	80.74	26

* Cat Number 2 was pregnant, nearly full term.

Average M. L. D. excluding cat Number 2, 87.62 Mg. of select cleaned digitalis per Kg. of cat.

TABLE V.

Intravenous Cat Method Assay of Petioles Separated from Select Clean Digitalis—Four Per Cent. Infusion.

Date and Time of Test.	No. of Cat.	Wt. in Kg.	Sex.	Mils of 4% Inf. Required.	Mils Required per Kg.	Mgs. of Drug per Kg.	Time in Minutes.
3-27-18, 9:53 P.M. ...	1	3.05	F.*	18.4	6.03	241.2	25
3-27-18, 11:31 P.M. ..	2	3.25	M.	28.2	8.67	346.8	44
3-28-18, 2:37 P.M. ...	3	1.635	F.	13.9	8.509	340	20
3-28-18, 10:52 A.M. ..	4	2.78	F.	21.8	7.84	313.6	34
4-21-18, 10:31 P.M. ..	5	2.2	F.	17.25	7.84	313.6	21
4-21-18, 11:26 P.M. ..	6	2.48	F.	21.55	8.69	347.6	29

* Cat was nearly full term pregnant.

Average M. L. D. excluding cat No. 1, 332.36 Mg. of petiole per Kg. of cat.

TABLE VI.

Intravenous Cat Method Assay of No. 50 Dirt Siftings Separated During the Process of Cleaning Digitalis—Four Per Cent. Infusion.

Date and Time of Test.	No. of Cat.	Wt. in Kg.	Sex.	Mils of 4% Inf. Used.	Mils Used per Kg.	Mgs. of Drug per Kg.	Time in Minutes.
3-37-18, 5:11 P.M.	1	3.355	F.*	90	26.82	1072	129
3-28-18, 4:13 P.M.	2	2.8	M.	35.15	12.55	502	35
3-29-18, 8:24 P.M.	3	3.8	M.*	66.6	17.52	700.8	121
3-30-18, 5:22 P.M.	4	1.865	M.	27.5	14.74	589.6	34
3-30-18, 7:43 P.M.	5	3.125	F.	37.4	11.96	478.4	63
3-30-18, 9:39 P.M.	6	3.87	F.*	79.4	20.51	820.4	130
3-30-18, 11:36 A.M. ...	7	2.7	F.*	53.9	19.96	798.4	100
3-31-18, 10:15 P.M. ...	8	3.325	M.	45.3	13.62	544.8	68
4-1-18, 12:00 M.	9	3.75	M.	40.8	10.88	435.2	70

* Number one and number six were each nearly full term pregnant. Numbers three and seven for some unknown reason were excessively tolerant. Average M. L. D. excluding cat No. 1, cat No. 6, cat No. 3, and cat No. 7, 510 Mg. of No. 50 Dirt siftings per Kg. of Cat.

the pulse rate followed by rapid increase just before death. Postmortem examinations revealed systolic hearts in each case with the exception of cat number six. All of the cats were unusually irritable and required more or less continual administration of a small amount of ether to keep them quiet.

TABLE VII.

Comparative Toxicity of Separated Portions of Digitalis.

Separated Portion.	Per Cent. Ash.	M. L. D. per 250 Gm. Pig.	Equivalent Cat Unit in Mg. Drug.	Relative Toxicity of Separated Portions by	
				Guinea Pig Method.	Cat Method.
Select clean digitalis	9.284	.04375	87.62	100	100
Petioles	8.76	.225	332.6	19.44	26.3
Number 50 dirt siftings.	56.81	.200	510	21.8	17.18

The above table gives the comparative activity of select clean digitalis, petioles, and number 50 dirt siftings presented in a form convenient for comparison. From the above observations we believe that all supplies of the drug digitalis should be carefully garbled and thoroughly cleaned before being used.

Summary.—Select clean digitalis produced during the season of 1917 in the Medicinal Plant Garden, College of Pharmacy, University of Minnesota, was more than twice as active when tested physiologically in the form of an infusion by the guinea-pig method as the arbitrary standard earlier proposed by Reed and Vanderkleed.

An infusion of the same drug when assayed by the direct intravenous cat method gave a cat unit of 87.62 milligrammes per Kg. of cat, which is about twelve per cent. more active than the average digitalis when tested by this method.

Relatively the Reed and Vanderkleed standard was found to be much lower than the generally accepted standard for digitalis when assayed by the cat method.

The petioles of digitalis examined contained a comparatively small amount of the active principles of the drug, being between one fourth and one fifth as active as the entire leaf.

The formation of the medicinal principles of the digitalis leaf appears to take place chiefly in those parts of the leaf where photosynthetic activity is most pronounced.

The number 50 dirt siftings separated from digitalis during the process of cleaning the drug showed an activity of between one fifth and one sixth that of the clean drug.

The hairs of the digitalis leaf apparently do not contain any or, at most, a relatively small amount of the glucosidal principles of the drug.

Infusions of the dirt siftings produced physiological effects upon guinea pigs and cats not characteristic of digitalis.

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THE NEXT U. S. P. REVISION.[1]

By E. Fullerton Cook, Ph.M.

The Pharmacopœial decade is rapidly passing and preconvention recommendations for an improved Pharmacopœia are already being heard in appreciable numbers.

A gratifying feature of these comments is the almost entire absence of serious criticism concerning the actual text of the U. S. P. IX. A few errors or desirable changes have been pointed out and are mostly corrected in the later printings of the U. S. P. IX. New conditions, brought about by the war, have altered the status of certain important trade-marked preparations, so that it is possible to now include these in the official list. This will likely be done through the publications of a supplement to the U. S. P. IX, a procedure authorized by the 1910 Convention.

The burden of criticism and suggestion in published comments, however, seems to centre about the question of a more speedy revision and various proposals, to further this end, have been made.

One of these recommendations advises an immediate revision of the book by the present Committee and the presentation to the Convention in 1920 of the completed manuscript for the U. S. P. X. Another plan proposes the establishment of a permanent U. S. P. laboratory, with the financial support of the U. S. P. Board of Trustees, or perhaps the United States Government, for the purpose of working out the problems of revision and for preparing the manuscript, supposedly in less time than heretofore required. Still other ideas concentrate upon an immediate and closer coördination, of the activities of all workers in pharmaceutical fields, with a view of previously working out many of the self-evident problems of the next revision and thus facilitating the next issue of the U .S. P.

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[1] Read before the Pennsylvania Pharmaceutical Association, June, 1918.

All of these proposals are worthy of consideration and adoption at least in part and should be utilized so far as practicable.

The first suggestion, up to a certain point, is desirable, but the conclusion of the revision is impossible since one of the first and most important duties of the new revision committee will be to select the articles to be included in the U. S. P. X. How would it be possible to revise the text until the contents of the book are decided?

The 1910 Committee can work out many problems and tests, under the direction of the chairman of the committee, as has been done effectively in the past, and present their report and recommendations for the use and aid of the new committee. For instance, one of the recommendations of the 1910 Convention was that the average amount of loss, resulting from the grinding of crude drugs, be determined, if possible, for each drug in the U. S. P. and included in a table as a guide to drug millers, but sufficient time was not available for collecting this data and the preparation of such a table for the U. S. P. IX, but such work could now be carried out by the sub-committee and thus be made available for the new Pharmacopœia.

The establishment of a permanent U. S. P. laboratory has been the dream of many workers in Pharmacopœial Revision, but its practicability is questionable. If established on a sufficiently comprehensive scale to be effective, with salaried experts in chemistry, pharmacy, botany, volatile oils, biological standardization, etc., and with the necessary equipment and assistants, the cost becomes prohibitive and we have the public statement of a government laboratory expert that the result of work from such a laboratory would be disappointing if speed is desired or expected.

To stimulate the fullest coöperation of every commercial and private pharmaceutical and chemical laboratory, of the workers in every college of pharmacy, and of every investigator in retail drug stores, is ideal and this help, before the revision starts, and afterwards should be utilized to the fullest extent.

I desire, however, to offer a constructive suggestion for the accomplishment of this much desired speeding up of the next revision. The present organization, or machinery of revision, has proven its efficiency. The committees have coöperated splendidly and worked smoothly throughout the revision. The general committee of fifty is needed for a full representation of the varied interests of the Pharmacopœia and to provide experts in every field from which to form the sub-committees, while the executive committee, composed of the chairmen of the fifteen sub-committees, is effective in coördinating all interests of the book and in securing decisions, and the one chairman for both general and executive committees affords the necessary centralization and harmony for the organization.

Now the chief cause of delay in revision work is acknowledged to be the time lost through the cumbersome method heretofore in vogue for interchange of opinions and for securing discussions and votes. If this one feature can be corrected, the time necessary for revision can be reduced to reasonable limits and the publication of the new book greatly facilitated.

In the last revision, those who observed the working of the committees, caught a clue to the solution of this problem. It consists in the establishment of a plan for frequent personal conferences during the active period of revision. This was tried to a limited degree, when revising the U. S. P. IX, and it thoroughly proved its value in securing prompt decisions, in clearing up many knotty problems satisfactorily and quickly, and in stimulating all members to intensive work.

The sub-committees may need only one or two such personal meetings, but, to obtain the full benefit from this plan, the executive committee should be authorized to meet at least once a month, during the whole of the active revision, to present reports, conduct discussions, and reach decisions.

This was accomplished heretofore by correspondence, amounting to thousands of pages, and when it is realized that the old plan required four weeks as a minimum, and often six or eight weeks or longer, for each decision of the executive committee, the value of this plan becomes apparent. (Two weeks were always allowed after the proposal of any proposition for its discussion, then came the mailing of the discussion and vote sheet and two more weeks for the votes to come in, before its announcement.)

The tax upon the energies and time of the members of the executive committee, if this meeting plan is adopted, is realized, but, by reducing the actual time of revision to one-third or less of that formerly required, which seems possible through this change, also by authorizing the payment of expenses and perhaps a small honoraria for the actual time required for the meetings, it is believed that the best workers could be persuaded to give the necessary time to the revision and thereby present the U. S. P. X to the country in record time and also provide a standard for medicine and pharmacy superior to any of its illustrious predecessors.

SOLVENTS FROM SEA WEED. NEW SOURCE OF ACETATE SALTS.

The success which has crowned the efforts of the Hercules Powder Company in the harvesting and fermentation of kelp on the Pacific Coast bids fair to relieve the present serious shortage of acetate of lime.

The story of the venture is one of solid achievement, and one of which American chemical engineers may justly feel proud. At the beginning of the war the Hercules Powder Company was faced with the necessity of developing an entirely new source of supply for acetone in the manufacture of cordite, the British smokeless powder. The company also needed potassium chloride in the manufacture of gunpowder. It has long been recognized that kelp contained potash, and the industry of burning the weed and obtaining the crude salt from the ash has provided for centuries a precarious living for the crofters on the coast of Scotland and elsewhere. It was not widely known, however, that the structure of the kelp plant could be destroyed and the potash released by simple fermentation, and that acetic, propionic, butyric and acids of this series are produced as the products of fermentation.

From the germ of this idea arose the five million dollar plant and marine equipment of kelp harvesters which is now operating on a three-shift, seven-day-week basis near San Diego, in southern California. Potassium chloride of unique purity, acetone, methyl ethyl ketone, acetone oil and iodine are being produced in increasing scale, while from the propionate and butyrate salts the ethyl esters are prepared, and will shortly be on the market.

The potash produced so far is not nearly sufficient to supply the chemical trade, where its sole application is being found on account of the extreme purity of the salt. Control analyses of the current product show a 96 per cent. grade, with less than 0.4 per cent. of sulphates, the remaining impurity being principally sodium chloride. The acetone and ketones produced by retorting the acetate salts are being used almost entirely in the manufacture of smokeless powder and aëroplane dopes under British contracts, thus releasing an equivalent amount of acetate of lime for industrial users. The solvents produced from the propionate and butyrate salts are something new in the solvent field, and by superseding amyl acetate, etc., in many directions, will still further ease the present acetate of lime shortage.

COLORIMETRIC DETERMINATION OF REACTION OF BACTERIOLOGIC MEDIUMS AND OTHER FLUIDS.[1]

By George D. Barnett, M.D.,
Passed Assistant Surgeon, U. S. Naval Reserve Force,
and
Herbert S. Chapman, M.D.,
Assistant Surgeon, U. S. Navy, San Francisco.

The colorimetric methods in common use for determining and adjusting the reaction of bacteriologic mediums and other fluids involve the use of standard solutions of known hydrogen ion concentration. A variety of such solutions has been described, and they are readily prepared by any one having a moderate chemical equipment and ability. Just now, however, many men with comparatively little chemical training are confronted with problems of this nature, and the method here described has therefore been devised to accomplish a fairly accurate determination of hydrogen ion concentration without the necessity of preparing standard solutions or of depending on those prepared by others. We are here concerned only with reactions lying between 7.0 and 8.0, and only phenolsulphonephthalein has been used as an indicator. Other indicators and other ranges of acidity will be investigated later.

In this method use is made of the principle of superimposing the two extreme colors of the indicator, as used by Clark and Lubs,[2] following Salm,[3] in determining the so-called half-transformation points of indicators. Within the range of its transition from red to yellow, we may regard the observed color of a phenolsulphonephthalein solution as composed of a definite amount of red plus a definite amount of yellow, and such a color may be exactly duplicated by superimposing the extreme red and the extreme yellow of the indicator in proper concentrations. Thus, if to one test tube we add 5 Cc. of dilute acid, and to another similar tube 5 Cc. of dilute alkali, and to each add 5 drops of phenolsulphonephthalein solution, a bright yellow will be produced in the first tube and a bright red in the other. But if we look toward the light through both tubes, a color will be observed that is half way between the yellow and the red. In fact, it will be identical with the color produced by 10 drops of the phenolsulphonephthalein solution in 5 Cc. of a standard solution having a pH 7.9. This is the half-transformation point, and is a definite constant for this indicator. But if instead of using equal amounts of indicator in each of the two tubes we vary the partition of the 10 drops of indicator between them, then by superimposing each pair and viewing them by transmitted light, a series of colors will be produced which will cover the range of usefulness of the indicator; and once such a series is "calibrated" against solutions of known hydrogen-ion concentration, it may be used as a standard series for the determination of unknown reactions.

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[1] From the Journal of the American Medical Association, April 13, 1918.

[2] Clark and Lubs, *Jour. Bacteriol.*, 1917, 2, 109, 191.

Results obtained by such a procedure in the case of phenolsulphonephthalein, comparison being made with phosphate solutions prepared according to Sorensen,[4] are as shown in the accompanying table.

RESULTS WITH PHENOLSULPHONEPHTHALEIN.

Acid tubes, phenolphonephthalein solution, drops.	Alkali tubes, phenolsulphonephthalein solution, drops.	pH.
9	1	6.9
8	2	7.2
7	3	7.5
6	4	7.7
5	5	7.9
4	6	8.1

OUTLINE OF METHOD.—*Apparatus and Chemicals Required.*—1. Clean test tubes. These must be of approximately the same diameter. An equal volume of water is measured into a number of tubes, and fifteen or twenty are selected for use in which the water stands at about the same level.

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[3] Salm, *Ztschr. f. phys. Chem.*, 1906, 57, 471.

[4] Sorensen and Palitzsch, *Biochem. Ztschr.*, 1910, 24, 387.

2. A 5 Cc. pipette.

3. A medicine dropper drawn out to a fairly fine point.

4. A burette.

5. An indicator solution. A convenient solution (0.01 per cent.) of phenolsulphonephthalein is prepared by diluting 1 Cc. of the usual solution used for kidney function tests (1 Cc. = 6 Mg.) to 60 Cc. with distilled water. No accuracy is necessary, provided the same solution is used throughout.

6. Roughly normal and twentieth normal sodium hydroxide.

7. Hydrochloric or sulphuric acid.

PREPARATION OF STANDARD COLOR SERIES.—Twelve test tubes are placed in two rows of six. Into each tube of one row 5 Cc. of dilute alkali are placed. (The twentieth-normal sodium hydroxide may be used, or any solution sufficiently alkaline to bring out the maximum red color of the indicators.) Into each tube of the other row, 5 Cc. of very dilute acid are placed. (One drop of concentrated hydrochloric or sulphuric acid to 100 Cc. of distilled water is sufficiently strong. Strong acid is to be avoided in the case of phenolsulphonephthalein, on account of its secondary color change.) Into the six tubes, 9, 8, 7, 6, 5 and 4 drops, respectively, of indicator are placed. Into the six corresponding alkali tubes, 1, 2, 3, 4, 5 and 6 drops of indicator are placed. If the dropper is held vertically, the drops will be practically of a size. Each pair of tubes thus contain 10 drops of indicator between them, and the series of six pairs, when viewed by transmitted light, will correspond to pH values of 6.9, 7.2, 7.5, 7.7, 7.9, and 8.1 (as in the table) when compared with 5 Cc. volumes of any solution containing 10 drops of the same indicator solution. In order to determine the hydrogen ion concentration of an unknown solution whose reaction lies within this range, 5 Cc. of it are placed in a test tube, 10 drops of indicator are added, and its color is compared with those of the six pairs of tubes. The use of a second tube containing distilled water to form a pair with the unknown is to be recommended, but does not appear to affect the results appreciably. The color series prepared in this manner is as accurate as that yielded by standard phosphate or other solutions when used in a similar apparatus, and can be prepared anywhere in a few minutes without the use of graduated apparatus or accurate quantitative solutions of any kind. As noted by Clark and Lubs, the use of pairs of test tubes is a device which is "optically very imperfect, but it works very well."

TITRATION OF MEDIUMS.—One Cc. of medium to be titrated is added to 4 Cc. of distilled water in a test tube. Ten drops of indicator are added, the color is compared with the color standards if it is desired to determine the initial reaction, and titration to the desired hydrogen ion concentration with twentieth-normal sodium hydroxide is performed. Fifty times the amount used will represent the amount of normal sodium hydroxide to be added to 1 liter of medium. If in carrying out the titration sufficient sodium hydroxide solution is added so that the indicator color is appreciably diluted, the end-point tubes of the comparator should be filled to a similar volume before the final comparison is made. If desired, in comparing colors, use may be made of the block described by Hurwitz, Meyer and Ostenberg,[5] though practically it has not been found to increase the accuracy appreciably. This is a wooden block in which two pairs of adjacent holes have been drilled to receive two pairs of test tubes. The holes are connected by slits so that each pair may be viewed by transmitted light. In this procedure one pair of holes would contain the acid-alkali pair chosen for an end-point, and the other the diluted mediums and a tube of distilled water. Compensation for colored fluids can usually be accomplished according to the principle introduced by Walpole,[6] by using in one row of the color standard series 5 Cc. amounts of the fluid made acid or alkaline.

COLLOIDAL METALS.[1]

By THOMAS STEPHENSON, F.R.S., Edinburgh.

During the last decade considerable attention has been devoted to the peculiar catalytic action of the metals in colloidal solution, and the application of this action to therapeutics. The nature and properties of colloidal solutions have long been known, but the assumption by metallic substances of the colloidal state is a comparatively recent discovery. It is a good many years since colloid silver was first prepared, but its therapeutic application dates back only to 1896, when, under the name of *collargol,* a colloidal preparation of silver was introduced by Crédé as an antiseptic. This substance, which occurs in small black scales having a metallic lustre, forms with water an opaque solution, which has all the properties of a colloid. Although a colloid, however, collargol is not really a colloidal metal, but it is generally considered to be a combination of an acid silver molecule with ammonia, i. e., collargolate of ammonia. Somewhat later, Trillet succeeded in preparing oxydases of certain metals by precipitating solutions of metallic salts with an alkali in presence of albumin, forming a kind of colloidal solution of the metals.

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[5] Hurwitz, Meyer and Ostenberg, *Bull. Johns Hopkins Hosp.*, 1916, 27, 16.

[6] Walpole, *Biochem. Jour.*, 1910–1911, 5, 207.

[1] From the *Prescriber*, June, 1918.

Still later, Bredig produced the solutions known by his name. These are true colloidal solutions of metals, and are produced by passing an electric spark through pure water between electrodes of the metal to be dissolved. The electric current diffuses a minute quantity of the metal throughout the liquid—the metal, in effect, becomes volatilized in the liquid. The resulting solution in every case is a dichroic liquid, transparent to transmitted light and opaque to reflected light. Suspended particles cannot be detected by ordinary methods, and the solution in all respects obeys the rules laid down for colloidal substances. The metal is in a state of very minute subdivision, and the particles possess that vibratory motion known as "Brownian movement." It is to this movement and to the minuteness of the metallic corpuscles that the catalytic action of Bredig's liquids is due. Different metals have been used, but it has been found that the nature of the metal is immaterial, the catalytic action of the liquid being due to the physical condition of the metal, and not to the metal itself.

Introduced into the system, these solutions produce remarkable physiological effects, effects that have been shown to be due entirely to the physical state of the metal, and are probably connected in some way with its electric condition. Their use in therapeutics is thus indicated.

With the object of arriving at some definite knowledge of the therapeutic value of these preparations, Robin and Bardet started in 1901 an extended series of trials, chemical, biological, and clinical, with these preparations. The oxydases of Trillet were found to be unsuitable for use in medicine; their powers of oxidation were unmistakable, but owing to their alkaline nature they produced necrosis in the tissues when injected, and had therefore to be abandoned. The solutions of Bredig, as described above, were found to be eminently suitable for therapeutic use, and a long and careful series of clinical trials were made with these with good results in such cases as pneumonia. One of the chief effects of injection of these solutions was intensified leucocytosis.

As has already been stated, this action appears to be due to the fineness of the metallic particles, and to their vibratory movement, and it has been demonstrated that, should microscopic examination show these particles to have become agglutinated from any cause, their therapeutic activity diminishes in direct proportion to such agglutination.

The only difficulty, but a very important one, which at first attended the employment in medicine of these liquids was their instability, the particles having a natural tendency to agglutination. The usual methods of preservation appeared to be useless. Sterilization by heat caused the particles to agglutinate, with consequent loss of activity, and the same result followed the addition of a foreign substance, such as sodium chloride. Moreover, when injected into the blood; the salts of the blood serum at once caused this agglutination and nullified any therapeutic action such solutions might have.

For several years, therefore, the colloidal metals, while they had their advocates in France, were regarded by British practitioners more as a therapeutic curiosity. Possibly in their country of origin, where their freshness might be confidently relied on, they found some application, but the instability and consequent unreliability of Bredig's solutions placed them beyond the region of practicle therapeutics.

Later, however, a method was found of overcoming this instability. This depends on the curious fact that an unstable colloid may be rendered stable *by the addition of a small proportion of another colloid*. On this principle these metallic solutions may be preserved and isotonized for therapeutic use.

Under the name of *collosols* an English firm has produced a series of colloidal solutions of metals that appears to meet all requirements. Their stability is maintained by the presence of an organic colloid, and their composition and physical condition remain unaltered when sodium chloride is added or when the solution is sterilized by boiling.

DETECTION AND ESTIMATION OF SMALL QUANTITIES OF HYDROGEN CYANIDE.[1]

By P. Lavialle and L. Varenne.

The authors recommend the following method as more sensitive and exact than any previous modification of the ferric thiocyanate method: The solution of alkali cyanide contained in a very small beaker is treated with a solution of calcium polysulphide, drop by drop, until it is distinctly yellow. The reagent is made by washing 20 grms. of lime until free from chlorides, mixing with 100 Cc. water, and passing a brisk stream of hydrogen sulphide through the milk of lime fifteen minutes; the liquor is filtered from the excess of lime, 5 grms. of washed, powdered, roll sulphur added, and the mixture heated on the water-bath for fifteen minutes. After treatment in the cold with this reagent for fifteen minutes the beaker containing the suspected liquid is placed on a boiling-water bath and evaporated to dryness, adding a drop of the polysulphide reagent from time to time if the color shows signs of disappearing. There can then be no loss of cyanogen at this stage. The residue is taken up in 5 Cc. cold water and acidified with 5 drops of dilute (1 : 5) sulphuric acid. Sulphur and calcium sulphate separate. Calcium carbonate is added gradually as long as there is effervescence, and then in excess to facilitate separation of sulphur by filtration. The filtered liquid is evaporated to dryness and taken up in 1, 0.5, or 0.25 Cc. water, and the solution acidified with 4, 2, or 1 drop of dilute (1 : 5) sulphuric acid. The proportion of acid is important: the concentration must be sufficient to prevent the formation of red ferric sulphite, which would interfere with the test, and yet insufficient to hinder the production of ferric thiocyanate. The use of smaller quantities of water than 1 Cc. makes it possible to detect smaller quantities of hydrogen cyanide. Ferric sulphate solution (5 per cent.) is now added, drop by drop, until there is no longer any increase in color intensity. The method will detect 0.01 mgrm. or even less of hydrogen cyanide.

The quantitative modification of the test requires all the reagents to be halogen free. It depends on the addition of very dilute standard (N/100 or N/500) silver sulphate solution to the ferric thiocyanate until the color is discharged; 1 Cc. N/100 $Ag_2SO_4 = 1$ Cc. N/100 HCN. In default of halogen-free reagents one can make two tests, using measured double quantities of all reagents in the second. Another way of surmounting the difficulty is to make two tests up to the formation of the ferric thiocyanate, then to titrate one with silver solution as described, and finally to titrate back with N/100 or N/500 ammonium thiocyanate solution until the color matches that of the solution which has not been titrated, but which has been diluted with distilled water to preserve equality of bulk between the two solutions. As little as 0.01 mgrm. of hydrogen cyanide can be estimated within 5 per cent.

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[1] *J. Pharm. Chim.*, 1918 (VII), 17, 97–102. From the *Analyst* for April, 1918.

Occasionally difficulty is caused by the separation of calcium sulphate and a trace of carbonate during the last evaporation. When this happens, it is best to filter the solution through a plug of cotton before evaporation is complete. The filtrate and washings are then evaporated to dryness, and no further trouble is experienced.

CAMPHOR SITUATION IN JAPAN.[1]

Commercial Attache F. R. Rutter, Tokyo.

Interviews with manufacturers of celluloid in Tokyo indicate that the supply of camphor is restricted. Camphor is allotted to these manufacturers in the proportion of their purchases some years ago. One of the largest factories in the country is compelled to work at half capacity because for some years it was engaged in manufacturing munitions for Russia and consequently has a small apportionment of camphor. While camphor is sold by the monopoly at 120 yen per 100 kin, it could easily bring 160 yen per 100 kin if sold in the open market.

The demand for camphor in Japan as well as in the United States has increased enormously, and undoubtedly the government intends to encourage the exportation of refined rather than crude camphor.

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[1] From *Commerce Reports,* June 10, 1918.

CULTIVATION OF BUCHU PLANT IN SOUTH AFRICA.[1]

Vice Consul Samuel W. Honaker, Johannesburg.

Although the buchu plant is said to be indigenous to South Africa its culture has been neglected in recent years. However, as late as 1908, 243,742 pounds of leaves were exported. The high price now prevailing is again stimulating interest in this plant to some extent, as the importance of meeting the demand is fully realized.

Probably one of the most accurate accounts of the cultivation of the buchu plant in South Africa is that by Mr. G. R. Van Wielligh, who, in the *Agricultural Journal* of the Union of South Africa for July, 1913, said in part:

The buchu is a hardy perennial and evergreen shrub belonging to the rue family of plants. The leaves of the buchu, to which the value of the plant is due, are opposite or scattered and are flat and dotted with oil glands, and the margins are glandular, serrate, or, in some cases, almost entirely revolute. When touched or dry the leaves emit a strong aromatic odor, which is due to a volatile oil contained in the glands. This oil is greenish in color when pressed out of the cells and when left to dry upon the leaves forms a camphor-like substance.

Three Species Used for Medicinal Purposes.—There are three species of the plant used in medicine. While containing the same essential oil and camphor, they differ in the shape, appearance, and color of the leaves.

The kloof buchu (*Barosma serratifolia*) grows in a soil somewhat moist, but not wet. Its average height is 4 feet, but it sometimes grows as high as 10 feet. It thrives in kloofs (ravines), among shrubs and granite rocks and in the shade of trees, and is also to be found in altitudes varying from 500 to 1,000 feet above sea level. A black, sandy loam, containing plenty of decayed vegetable matter, is said to be favorable to its growth. The leaves of this species are dark green, resembling somewhat those of the orange tree, to which it is also similar, in that glands are shown in the lamina of the leaves.

Another species, the mountain buchu (*Barosma betulina*), is probably the most valuable, as it contains the greatest number of oil glands in its smaller, light green leaves. It is more compact and dwarfed than the kloof buchu. It grows from 3 to 4 feet in height and is often found on mountain slopes at an altitude of 1,000 to 2,000 feet above sea level. A red, sandy loam, or red sandstone and quartzite, is said to be favorable to its growth.

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[1] From *Commerce Reports*, June 11, 1918.

The third species (*Barosma crenulata*) has larger leaves than the others. These leaves are 1 inch to 1½ inches in length and are of a smooth, leathery texture; they are ovate-oblong in shape, with serrate or granular margins. The oil glands are visible on both sides of the leaf. However, this species of the buchu is not so widely distributed and is consequently not so well known.

The buchu does not thrive in every soil. In its native state it is not found in earth having limestone as one of its component parts, nor in brackish or sandy soil and stiff clay. On the other hand, a black or red sandy loam, according to the species, impregnated with decayed vegetable matter, facilitates its culture. However, good results are said to be obtained when the plant is cultivated on sandy loam, properly drained and deeply dug, but not irrigated by brackish streams.

METHOD OF CULTIVATION.—Plants can be grown from seeds or cuttings. In case the former method is used, the sowing generally takes place before the weather becomes cold. Boxes and beds are used for that purpose. Boxes are most often filled with a compost of vegetable mold and sand in equal parts, in which the seeds are buried at a depth of about one half inch. They are then generally placed in the shade in a warm place and kept moist. After a few weeks have elapsed, the seeds spring up and the boxes may then be shifted to receive the morning sun. As a rule, all the protection that is required is from sharp frosts and cutting winds, but the soil should be kept moderately moist and free from weeds.

If beds are used they should be dug very deep, and some of the soil should be removed and replaced by a vegetable mold and sandy loam. Sometimes boards are placed on the edges of the beds, or stones or sod are piled around them from 12 to 13 inches in height. The beds are generally covered with branches to shut off most of the light, as too much exposure to the rays of the sun at first often causes damage. As the seedlings appear more light is allowed, but they should not be exposed to a baking sun to any great degree.

For the purpose of transplantation, which usually takes place when the atmosphere is not too dry or scorching, the ground is usually trenched or plowed to a depth of 2 feet to induce deep rooting. As a rule, the plants should be 5 feet apart in each direction, leaving ample room for the cultivator to pass between the rows. It is the general opinion that the best time to plant is when growth is dormant. In case it does not rain during this period it is customary to irrigate the ground.

After planting is completed no special care is taken other than to weed and rake the soil, so as to conserve the moisture. Raking should be done lightly in order not to disturb the roots, which, although spreading in all directions, are not firmly anchored in the ground as compared with most other shrubs. However, by deep trenching the roots are induced to penetrate the soil more deeply.

PHILADELPHIA COLLEGE OF PHARMACY.

Minutes of the Quarterly Meeting.

The quarterly meeting of the Philadelphia College of Pharmacy was held in the Library, June 24, 1918, at 4 P.M. The President, Howard B. French, presiding.

The minutes of the annual meeting held March 25, 1918, were read and approved. The minutes of the Board of Trustees for March, April and May were read by the Registrar, J. S. Beetem, and approved.

The report of the Committee on Membership was read by Professor F. P. Stroup. The recent special effort to increase the membership has been very successful, 117 had already been elected to active membership and 69 to associate membership, with a number more now under consideration. It was expected that some follow-up work during the summer would bring in a further number of applicants for membership.

The Committee on Necrology presented a supplemental report being a memoir of the late James L. Bispham, who was a member of the college for sixty-two years. (See American Journal of Pharmacy, June, 1918, page 470.)

A verbal report for the delegates to the New Jersey Pharmaceutical Association was made by the Chairman, Professor J. W.

Sturmer. The meeting was held at Spring Lake, New Jersey, June 18–20. Five members of the Faculty of the College and two members of the Board of Trustees were present. Several members of the Faculty read papers. This meeting was a very interesting one, but not so largely attended as the recent meetings of this Association.

The resignation of Miss Katherine E. Nagle, Librarian, was presented to take effect June 25, as she had accepted a government position. A letter from President French to Miss Nagle was read, regretting the severance of association with the College as Librarian. On motion, a leave of absence for three months, without salary, was granted the Librarian.

President French read a communication to President Wilson sent by the Alumni Association under date of June 11, 1918, relative to the formation of a Pharmaceutical Corps in the Army, asking the President to support the legislation now pending to that end. The receipt of the communication had been acknowledged by Mr. Tumulty, the Secretary to the President.

Mr. French read a circular letter that had been given him from the War Department addressed to all collegiate institutions regarding some of the draft exemptions and a continuation of study by the students in educational institutions. After remarks and explanation the subject was referred to the Committee on National Defence appointed by the Board of Trustees.

The President made the following appointments: Delegates to the meeting of the American Pharmaceutical Association, at Chicago, August 12, 1918, Charles H. LaWall, Chairman, E. F. Cook, Louis Gershenfeld, C. B. Lowe, F. X. Moerk, F. P. Stroup, John K. Thum, H. W. Youngken; Committee on Necrology, C. B. Lowe, E. M. Boring, C. A. Weidemann; Committee on Nominations, C. B. Lowe, C. S. French, E. F. Cook, F. E. Stewart, C. A. Weidemann.

C. A. Weidemann, M.D.,
Secretary.

Abstracts from the Minutes of the Board of Trustees.

March 5, 1918.—Committee on Library reported that the Library had been used during the month by 565 persons. Several gifts had been received but no purchases made. 8,150 books were catalogued and cards filed to date.

Committee on Instruction submitted an important report recommending the inauguration of *four Special Spring Courses,* the object of which was to fit students for service in the Army. The committee submitted the draft of their recommendations, as follows:

The first a laboratory course in bacteriology especially devoted to the consideration of the bacteriology of infectious diseases, open to graduates in Medicine and to others who already have received the necessary training in general bacteriology.

The second a laboratory course in clinical and sanitary analysis. This course to be open to graduates in pharmacy and others who have already received the necessary training in qualitative and quantitative chemical analysis.

The third a laboratory course in the microscopy of food and drugs for graduates in pharmacy and others who have received preliminary training in botany and vegetable histology.

The fourth a course in first-aid and bandaging for pharmacists and others qualified to profit by the instruction.

A committee of three was appointed to attend the hearing of the Edmonds' Bill on March 19, 1918, as Washington, D. C.

Professor Charles H. LaWall and Professor E. Fullerton Cook were unanimously elected professor of theory and practice of pharmacy and professor of operative pharmacy and director of the pharmaceutical laboratory respectively.

Communications were read from Mr. Henry S. Wellcome and the University of Havana relative to the death of Professor Remington.

Communications were also read from Professor Cook and Mr. Otto Raubenheimer expressing their appreciation of the honor conferred upon them in being elected to receive the degree of Master in Pharmacy.

The Committee on Membership reported favorably upon the application of William R. Keeney for Active Membership and Edward Kraus for Associate Membership. A ballot was taken and they were unanimously elected.

April 2, 1918.—A communication was received from the secretary of the College reporting the results of the election of officers and trustees.

George M. Beringer was reëlected chairman of the board, Walter A. Rumsey, vice-chairman, and Jacob S. Beetem, registrar, for the ensuing year.

The Chair announced the Standing Committees for the year.

Committee on Library presented no report but the chairman stated that the public library would be glad to receive books for the war libraries and suggested that we make a donation of duplicate books. On motion, the committee was authorized to select such duplicate books they deemed of interest and present the same; also to keep a record of the books given.

Committee on Museum and Herbarium reported progress.

In this connection, Mr. French said he thought the time had come for the Property Committee to request that a new inventory of each department be taken and a record made of what belonged to the College and what to the professors. This suggestion met with general approval and after Professor Sadtler had said that it was his intention to present to the College his collection, Mr. Cliffe moved that in the future a gift to the College should be so marked and if a loan, this should be marked as such with the name of the owner upon same. This was seconded and ordered.

Mr. Beringer said that several large packing boxes were in the College containing his herbarium and now that arrangements were being made for making a new inventory of college property, he desired to present his collection to the College. On motion of Mr. French, the thanks of the College were extended to Mr. Beringer for his valuable gift.

Professor Sturmer reported on the matter of spring courses. Following a trip to Washington, Professor Sturmer said that Major Russell—before whom the matter was laid, was very glad to know that the Philadelphia College of Pharmacy intended giving such a course, but regretted he could not be of assistance in sending students as there were not enough men to spare to fill the assignments to the War College and to the Rockefeller Institute. He would, however, be glad to have a list of the men who finish such courses at the College as these men would be considered candidates for admission to intensive training with the view to assignments as bacteriologists in the Sanitary Corps in which capacity they could attain a commissioned rank. Major Russell further stated that the demand for bacteriologists in the Army was urgent and that large numbers of men trained in this branch would be given the opportunity to earn commissions.

A communication was read from Professor Cook recommending William C. Marshall as assistant in the Pharmaceutical Laboratory for the balance of the term. Approved.

Committee on Examinations reported that Emil Albert Wepfer and Norman C. Braker had furnished satisfactory evidence of four years' practical experience and that they be declared graduates and granted a diploma (Ph.G.) at the next commencement. It was so ordered.

Special Diploma Committee reported that diplomas were needed for the Phar.D. degree and that some changes in the wording was necessary. Approved.

Mr. French read a communication from the State Department of Education, Albany, N. Y., dated March 29, 1918, as follows:

"I have pleasure in advising you that the Board of Regents, at their meeting held March 28, formally registered the Philadelphia College of Pharmacy as an approved School of Pharmacy.

Yours very truly,
(Signed) AUGUSTUS S. DOWNING,
Assistant Commissioner."

Mr. Cliffe moved that the Special Committee on New York matters be discharged with the thanks of the board for their long, arduous and very successful labors. So ordered.

Mr. French read a letter from Mrs. Wm. E. Lee, Secretary W. O. N. A. R. D., relative to granting scholarships to women students and thus encouraging them. The subject was fully discussed, when on motion the Committee on Scholarships was authorized to convey to Mrs. Lee the sentiments of the board.

Prof. Charles H. LaWall verbally expressed his appreciation of his election to the Chair of Theory and Practice of Pharmacy.

A communication was read from Prof. E. Fullerton Cook, expressing his appreciation of the honor conferred by his election to a full professorship.

A formal statement was also read from Professor Cook giving to the College, apparatus, etc., in the Pharmaceutical Laboratory, bequeathed to him by the late Prof. Remington. This was accepted with the thanks of the board.

The request of Henry Morris, P.D., Class of 1911, that his name on diploma be changed from Morris Hamowitz to Henry Morris in accordance with the decree issued by the Probate Court, State of Michigan, was on motion granted.

One application for Life Membership, seventy-seven applications for Active Membership and forty-one applications for Associate membership were read and referred to the Committee on Membership.

May 7, 1918.—Committee on Library reported that a number of gifts had been received and several purchases made. There has been a total of 9,342 books accessioned and shelf-listed and 8,504 books catalogued to date. The Library was used by 635 persons during the month.

Committee on Property reported the absence of the janitor owing to a sudden attack which necessitated his removal to the hospital.

Committee on Museum and Herbarium reported progress and expressed appreciation of the valuable assistance of Prof. Youngken.

Committee on Instruction reported that they had given further consideration to the subject of post-grauate courses and to the annual reports of the various departments of the faculty. The committee had been impressed with the necessity for continually reviewing and advancing the requirements of the technical chemistry course for which a certificate of proficiency in chemistry is awarded.

The committee has outlined additional courses of instruction; several of which they recommend should become a part of the required tuition of the technical and chemical courses. These recommendations were taken up seriatum and after discussion the following recommendations were adopted:

1. That a course in applied bacteriology covering a period of not less than 90 hours be given to the technical chemistry students.

2. That a course in technical microscopy, as required instruction, covering a period of not less than 120 hours be given.

3. That there be outlined an optional elementary course covering a period of 60 hours as preparatory to the technical microscopy course for those students who have not the required preliminary knowledge in botany and histology.

4. That an optional laboratory course in physiologic testing be outlined.

5. In addition to the laboratory course outlined for post-graduate students in the technical chemistry course, that the lectures on industrial chemistry and chemical control be made a compulsory part of the course, and that special lectures be given for a period of not less than 30 hours. In addition they shall be required to take the general chemical lectures given the first and second year pharmacy students.

6. That there be assigned on the roster for students in the tech-

nical chemistry course recitation periods and that each student be required to attend.

7. A course in chemical engineering, as outlined by Frank X. Moerk, as part of instruction for students in the technical chemistry course.

8. That instruction in foreign literature as now outlined for special students be changed to read: Instruction in Foreign and Domestic Current Chemical and Pharmaceutical Literature.

The Committee on Instruction stated that the report from the various members of the Faculty have been eminently satisfactory and very few changes in the course are necessary. The conferences held by the Faculty have resulted in coördinating the work of the various departments and will, therefore, be continued.

The recommendation of Prof. Cook referred to in the annual address of the President, namely, that members of the board actively engaged in the drug business be asked to hold a conference annually with the instructors in the various departments to assist in making the course thoroughly practical, meets with the approval of the committee.

Prof. Youngken reported that the present instructor had resigned with the close of the college session and requested that he be given authority to select an assistant.

The committee recommends that Prof. Heber W. Youngken be elected professor of botany and pharmacognosy. The committee also stated that during the absence of Dr. Roddy in military service that the work of the Department of Bacteriology and Hygiene had been carried on by Louis Gershenfeld and recommend that he be given the title of assistant professor of the Department of Bacteriology and Hygiene.

Propositions for additional prizes have been submitted to the committee by Professors LaWall, Sturmer, Cook and Youngken, Instructor Griffith and the Estate of Joseph P. Remington, the exact conditions for these awards will be published in the announcement.

The various recommendations of the committee, after discussion, were approved, excepting that relating to the election of professor of botany and pharmacognosy, which according to the by-laws was laid over for one month.

Mr. Cliffe, for the Committee on Special Diplomas, reported the wording on the diploma for the degree of Ph.C. After discussion, the report was adopted.

A communication from Miss Elizabeth Ottinger, offering a prize of twenty-five dollars in memory of her father, James J. Ottinger, was read; also a letter from Prof. LaWall relative to same. The offer of Miss Ottinger was accepted with the thanks of the Board.

A communication was read from Prof. Gershenfeld covering the Liberty Loan subscriptions as raised by the students amounting to $12,000.

May 27, 1918.—Adjourned meeting.

Mr. French introduced each one present to Mr. Henry S. Wellcome, Class 1874, of London, England, who remained as a guest for a while and before leaving expressed his appreciation of the work the Philadelphia College of Pharmacy was doing in maintaining the highest standard in the profession and also for what his early training in the institution had done for him.

The Committee on Examinations reported the results of the recent examinations and presented the names of those entitled to the various degrees: thirteen for the degree of Doctor in Pharmacy (P.D.) who matriculated in 1915 or at a prior date; six Pharmaceutical Chemists for the degree of Doctor of Pharmacy (P.D.); seventy-five for the degree of Graduate in Pharmacy (Ph.G.). All the above were elected to receive the degrees.

Thirteen of those who have completed the examination and will receive the degree of Ph.G. upon reaching their majority.

Twenty-six who had passed all examinations and will receive the degree of Ph.G. when the requirements as to age and experience have been met.

Three for the degree of Doctor in Pharmacy (Phar.D.).

The committee then presented the names of those to whom prizes were to be awarded.

The committee also reported that Clarence H. Henderson had finished his work in the Food and Drug Course; Leo J. McCarriston had finished his work in Analytical Chemistry; Bernard Kane and Harry Wishnefeky had finished their work in Industrial Chemistry and were, therefore, entitled to certificates. On motion, certificates were granted them.

The name of Miss Bessie C. M. Fox, Class of 1917, was also presented and as she had completed full four years' experience was granted the degree of Graduate in Pharmacy.

The names of three applicants for the degree of Master in Pharmacy (Ph.M.) in course was received and action on same was deferred until the next meeting.

Prof. Sturmer presented the names of Henry Reuby Abrams and Simon Green as being entitled to certificates for special work, which were, on motion, granted.

A list of forty-two applicants for Active Membership and twenty-seven for Associate Membership was read and referred to the Committee on Membership.

The list of seventy-eight applicants for Active Membership and forty-one for Associate Membership, presented at the last meeting, having been favorable reported on by the Committee on Membership, was balloted for and unanimously elected.

The Committee on By-Laws presented a number of alterations and amendments to the By-Laws but action was deferred until the next meeting.

The number of stars in the Service Flag of The Philadelphia College of Pharmacy is constantly increasing and now the number of the Gold Stars, indicating those who have sacrificed their lives on the altar of liberty in service to their country and to humanity, is becoming conspicuous and these will ever be silent tributes to their valor and fame.

The following are those who have recently been added to this list of those who have "gone on":

George Paul Sheperdson.—Private 1st class, Hospital Unit No. 20, University of Pennsylvania. A special student at the P. C. P. during 1912–1913. Died May 4, 1918, in France of scarlet fever. For many years Mr. Sheperdson was in the employ of Rees C. Roberts, of Ambler, Pa., and for a time was a detail man for the Keasby & Mattison Company.

Ensign George B. Evans, Jr.—A graduate of Hill School and of Cornell University. Was a student at the P. C. P. during 1915–1916 and part of the course of the following year. When the United States entered the war, he enlisted in the Naval Reserves and was assigned to the air forces, in which service he soon won his commission.

He was killed at Miami, Florida, May 31, 1918 (aged 25 years), by the fall of his aëroplane into the bay. He was the son of George B. Evans, Sr., class of 1880 P. C. P., and now a trustee of the College and a prominent merchant and member of the Union League.

Allen K. Hartman, P.D. 1912.—A native of Akron, Pa., employed formerly in the drug business in Lancaster, Pa. He enlisted in the Army in December, 1917, died of pneumonia in France, March 10, 1918, only a few days after landing. Aged 28 years.

Guy W. Showers.—A graduate of the class of 1916. He was a native of Harrisburg, Pa., nad was a graduate of the Technical High School in that city and was for a time in the employ of E. Z. Gross. Later he conducted a private bacteriological laboratory and made analyses for the local physicians. He served as a member of Ambulance Corps No. 12 and died from injuries received when the ambulance he was helping to unload was bombed by a German aëroplane. He passed away on May 29, 1918, in France at the age of 23 years.

THE FORTY-FIRST ANNUAL MEETING OF THE PENNSYLVANIA PHARMACEUTICAL ASSOCIATION.

Considering the fact that shortage of help and wartime conditions made it impossible for many druggists to attend their State conventions this year, the forty-first annual meeting of The Pennsylvania Pharmaceutical Association held at Wilkes-Barre, June 25 to 28, was highly successful in accomplishments.

Six sessions of the meeting were held at the Hotel Sterling, Wilkes-Barre, and two sessions at the Hotel Oneonta, Harvey's Lake, 16 miles outside of the convention city limits.

Mr. Croll Keller, Chairman of the Executive Committee, read the report of that committee, in which the suggestion was made that consideration be given to the matter of aiding members of the Association who have been called to the colors, in disposing of their business or in conducting it during their absence.

The Committee also recommended that action be taken on the suggested legislation for the control of venereal diseases, and this matter be referred to a committee of three, including the Secretary, for the preparation of a definite plan of action and suitable resolutions for adoption at a later session of the meeting.

Secretary Robert P. Fischelis read his annual report, reviewing the work of his office for the year. A condensed style of makeup was suggested for the 1918 proceedings, and this was approved by the Executive Committee.

The most important work of the Secretary's office during the year, next to publication of Proceedings, was the launching of *The Pennsylvania Pharmacist* on the journalistic sea. This is a quarterly publication intended to keep the members informed of the activities of the Association during the period between meetings. Three issues have been published, each one containing a leading article written for newspaper publicity purposes. These articles were widely reprinted in newspapers and other journals. The June issue of *The Pennsylvania Pharmacist* contained the full convention announcement and programme, thus saving the expense of mailing a separate announcement to the members.

The report of the Secretary was accepted with an expression of appreciation for the work that had been done in making *The Pennsylvania Pharmacist* a reality.

At the second session, Dr. F. E. Stewart read the report of the Committee on Patents and Trade-marks. This report covered the subject thoroughly and contained some very important recommendations for the guidance of all those interested in the revision of our patent laws. It was referred to the National Research Council at Washington and the Secretary was instructed to send copies of it to other interested associations. The report was discussed by Professor LaWall and Mr. J. W. England.

The address of President Knoepfel contained many valuable recommendations. In part he said: "Our nation is at war and it is my positive conviction that history will concede that ours was a just cause, that we held high ideals, and our ambitions were most worthy. This mighty struggle has produced many problems for all branches of pharmacy. The colleges find their students enlisting or being drafted, and few new ones coming to replace them. The manufacturer finds it impossible to obtain all the supplies needed; many items being off the market. The wholesaler, because of the demands of the government on the manufacturer and because of transportation difficulties, is unable to keep up stock; and the retailer suffers from all these causes and many others. However, there is cheerful acquiescence, on the part of all in submitting to any hardships which the war has entailed. We must win this war; and to this end we are willing to sacrifice everything we have, if it be necessary. Our business, our properties, even our lives.

It is only common sense to declare that there should be no injustice in the division of the burdens. If they are heavier on our profession than we think proper, it is our privilege and duty to protest."

The following are some of his recommendations:

That the general principle underlying legislation for curtailing the sale of venereal disease nostrums be approved and that the Legislative Committee be directed to coöperate with the Government to secure legislation that will be wise and just in its restrictions of the sale of nostrums and treatments for diseases of this character.

That the Association voice its approval of the objects of the National Pharmaceutical Service Association and coöoperate with this organization to bring about a better condition for pharmacists in the Army.

That the Legislative Committee be instructed to coöperate with other associations in an endeavor to have the State Mercantile License Law repealed.

That the action of any publisher who refuses to accept mail order advertising be endorsed.

That affiliation with the National Association of Retail Druggists and the payment of annual dues of $25.00 be continued.

That the Association endorse the movement inaugurated for the purpose of giving druggists shorter working hours.

That Congressman George W. Edmonds be elected an honorary member for his earnest efforts to secure government recognition for pharmacists.

That *The Pennsylvania Pharmacist* be continued in its present form and that expense be curtailed in other directions, if necessary, in order to continue its publication.

Dr. E. G. Eberle then presented a paper entitled "Loyalty to the Country and to Pharmacy," which was received with much enthusiasm.

Professor J. W. Sturmer then read a paper entitled "The Acid Test," in which he cautioned against lowering the standards for registration of pharmacists in the State as a wartime measure. He pointed out that lowering the bars at this time would have its effect for years to come, because pharmacists once licensed could not have their licenses revoked and the State might suffer at the hands of incompetents for a long time in the future if the educational standards were lowered now.

The following additional papers were presented at the several sessions:

"The Value of the Microscope in the Drug Store," by Professor Heber W. Youngken.

"Some Thoughts on Salesmanship as Applied to the Retail Drug Store," by Edward T. Hahn.

"An Efficient and Profitable Toilet Lotion," by Chas. R. Rhodes.

"Wanted, the Old-fashioned Pharmacist," by J. W. England.

"Aspirin Tablets," by Robert C. White.

"An Opportunity to Conserve Fats, with Special Reference to Zinc Oxide Ointment," by Edward T. Hahn and Robert P. Fischelis.

"Some Observations on the Dissolving of Zinc Chloride and Several Suggested Solvents," by Mr. and Mrs. J. C. Peacock.

"Laboratory Notes," by George E'we, the latter paper being read by title.

"Hot Cocoa," by Chas. H. LaWall.

"War-time Topics for the Pharmacist," by Robert P. Fischelis.

"The U. S. P. Revision," by E. Fullerton Cook.

"A New and Novel Method of Determining the Amount of Methyl Alcohol in Mixtures of Methyl and Ethyl Alcohol," by William G. Toplis.

The following papers were read by title:

"Organotherapy," by J. Atlee Dean.

"Which is More Profitable a Cash or Credit Business for the Retail Druggist," by Harold J. LaWall.

"Do You Want to be Classed as a Retail Liquor Dealer?" by B. E. Pritchard.

"Normal Salt Solution," by Louis Gershenfeld.

"If the Druggist's Landlord Raised His Rent, Would He Be Justified in Accusing the Landlord of Profiteering?" by Franklin M. Apple.

"Notes on the Action of Oxygen-bearing Compounds Upon Flavoring Oils," by Ivor Griffith.

"The Therapy of Heavy Magnesium Carbonate and Reports on Its Use as a Cathartic," by St. Clair Ransford-Gay.

Immediately after the reading of the paper on Conservation of Fats the Secretary brought up for discussion the matter of conservation of drugs and the revision of formulas containing alcohol, sugar and glycerine as proposed by Mr. F. A. Upsher Smith and others. After due consideration of the subject Mr. Hunsberger moved that it was the sense of the Pennsylvania Pharmaceutial Association that present formulas in the U. S. P. and N. F. remain unaltered unless the revision committees of these respective works deemed such changes necessary.

The following resolutions on the Edmonds Bill were adopted:

We recommend that the following resolutions proposed by the War Defense Committee be approved by the Association and that copies be forwarded by the Secretary, to President Wilson, Secretary of War Baker, Surgeon-General Gorgas, Honorable S. Hubert Dent, and Representative George W. Edmonds:

Resolved, That this Association hereby pledges itself anew to the cause of justice and liberty and its resources in fullest measure, that early and complete victory may rest upon our arms, and,

Resolved, That, through our concern, lest the health of our troops when sick or injured be endangered by the present lack of proper pharmaceutical service in the Army, we earnestly urge the immediate passage by Congress of the Edmonds Bill (H. R. 5531) creating a Pharmaceutical Corps similar to that now in the French Army.

Resolved, That we urge upon Congress the vital importance of this Bill, not only because it will insure the safe dispensing of medicines in the Army, a condition which does not now obtain, but also because thereby the medical units will be provided with a large number of trained assistants or laboratory technicians, who can also aid in enforcing sanitary regulations, and in carrying out the innumerable activities upon which the health and lives of our armies depend. This class of men require years of special training for such service and are now extensively used in the army for non-pharmaceutical work.

The Nominating Committee presented the following list of nominees:

For President, Chas. R. Rhodes, of Hyndman.
For First Vice-President, Ambrose Hunsberger, of Philadelphia.
For Second Vice-President, James F. Kane, of Pittston.
For Secretary, Robert P. Fischelis, of Philadelphia.
For Treasurer, F. H. E. Gleim, of Lebanon.
For Assistant Secretary, Louis Saalbach, of Pittsburgh.
Member of the Executive Committee for three years: William H. Knoepfel, Scranton.
Local Secretary, C. Clyston Jones, Easton.

CORRESPONDENCE.

University of Chicago,
Chicago, Illinois, July 15, 1918.

To the Editor:

It is important that pharmacists should be familiar with the official names for synthetic drugs so far adopted by the Federal Trade Commission. These are:

Arsphenamine for salvarsan, diarsenol and arsenobenzol, etc.

Neoarsphenamine for neosalvarsan, neodiarsenol and novarsenobenzol, etc.

Barbital for veronal.

Barbital-sodium for medinal and veronal-sodium.

Procaine for novocaine.

Procaine nitrate for novocaine nitrate.

Phenylcinchoninic Acid for atophan.

Under the authority of the Trading with the Enemy Act and with the advice of the Subcommittee on Synthetic Drugs of the National Research Council, the Federal Trade Commission has provided for the manufacture in this country of the important synthetic drugs which before the war were imported from abroad, chiefly from Germany.

To insure the production of the synthetic drugs urgently needed, the Federal Trade Commission had to make it worth while for manufacturers to undertake the preparation of these articles without permitting their cost to become prohibitive but rather approaching the prices current before the war. This was accomplished by granting licenses good for the life of the patents under which such drugs are made and thus making a permanent investment for their production profitable. Partly to insure for manufacturers a market for their products after the war and in large part inspired by the idea of encouraging the establishment of a permanent American industry in these important articles, the commission wisely decided that American houses should be put on the same footing as the foreign houses for the after-the-war competition by imposing on all licenses the obligation to use new, official names for the articles, names which after the war will be open to all competitors, domestic and foreign.

Obviously if these names are once in common use the exclusive rights of the foreign houses and their agents of using after the war the old established trade-marked names will not seriously handicap the American firms, and all competitors will be on the same footing, with the advantage only to those who can produce most cheaply the better article.

It is obvious that the American physician in final instance is the arbiter who can put this wise plan into operation and establish the new names firmly by prescribing these remedies by their new official names. However, *the adoption of these names by physicians will depend very largely on the pharmacist's familiarity with them.* Unless the physician is confident that the pharmacist to whom his prescription is taken is familiar with the official names, he will feel constrained to use the old, proprietary names. The pharmacist, therefore, should familiarize himself with the new, official non-proprietary names given at the beginning of this letter.

Yours truly,

Julius Stieglitz, *Chairman,*

Subcommittee on Synthetic Drugs National Research Council.

July 15, 1918.

To the Publisher:

Will you kindly call attention through your columns to the need for technically trained persons for the examining corps of the Patent Office. Men or women are desired who have a scientific education, particularly in higher mathematics, chemistry, physics, and French or German, and who are not subject to the draft for military service. Engineering or teaching experience in addition to the above is valued. The entrance salary is $1,500.

Examinations for the position of assistant examiner are held frequently by the Civil Service Commission at many points in the United States. One is announced for August 21 and 22, 1918. Details of the examination, places of holding the same, etc., may be had upon application to the Civil Service Commission, Washington, D. C., or to this office.

Should the necessity therefor arise temporary appointments of qualified persons may be made pending their taking the Civil Service examination. Application for such appointment should be made to this office.

Very truly yours,

J. S. Newton,

Commissioner of Patents.

OBITUARY.

WILLIAM LAWRENCE DEWOODY.

The "Grim Reaper" has exacted another toll to his fateful list of the year. Mr. W. L. Dewoody, honorary president of the American Pharmaceutical Association, died at his home in Pine Bluff, Ark., on Sunday, June 30, in the seventieth year of his age.

The deceased was born at Athens, Ala., on December 30, 1848. His father was a pharmacist and so William early acquired a knowledge of drugs and of the drug plants of his neighborhood and quite naturally took a liking to the drug business. In 1870, he engaged in the wholesale drug business in Pine Bluff, the firm then being Nelson and Dewoody. Later he became the head of this business and this was continued as a wholesale and retail drug store under the name of W. L. Dewoody & Co. until the present.

Mr. Dewoody was a typical southern gentleman and a pharmacist possessing high ideals and the professional spirit of his calling. He was a member of the Arkansas Pharmaceutical Association and for some years served as a member of the State Board of Pharmacy. He was likewise a member of the National Wholesale Druggists' Association.

He joined the American Pharmaceutical Association in 1887 and since that time was one of the most faithful of the members in attendance. His kind manner and lovable disposition won for him a host of friends and he will be greatly missed in the circle of attendants at the meetings of the Association.

JOHN HARPER LONG.

Dr. John H. Long, professor of chemistry at the Northwestern University, died at his home in Evanston, Ill., on June 14, 1918, after an illness lasting for about nine months. His friends and family thought that he was making progress toward recovery of health, when he was overcome by a sudden attack of the heart trouble from which he had been suffering.

John Harper Long was born near Steubenville in December, 1856. In 1877 he was graduated from the University of Kansas, with the degree of B.S. From 1877 to 1880 he studied in the foreign universities at Tübingen, Würzburg and Breslau, receiving the degree of Sc.D. from Tübingen.

In 1881 he was appointed professor of chemistry at the Northwestern University Medical School. In 1913 he was made the dean of the Pharmacy Department of that University and retained this position until last year.

Professor Long was a member of many scientific organizations and in most of these took an active part. He was president of the American Chemical Society in 1903. He had also served as president of the American Association for the Advancement of Science.

As a member of the Council on Pharmacy and Chemistry of the American Medical Association, from the time this council was organized, he had made many investigations in behalf of its work. He was a member of the Committee of Revision of the U. S. Pharmacopœia IX. Likewise, a member of the consulting referee board of experts for the U. S. Department of Agriculture.

He was the author of many excellent papers and was noted for his research work, which was in recent years very largely associated with problems of biologic chemistry.

NEWS ITEMS AND PERSONAL NOTES.

Vacancies in the Committee of Revision of the U. S. Pharmacopœia Filled.—While the members of the Committee of Revision were balloting by mail to fill the eight vacancies on the committee, caused by death since the selection of the committee in 1910, a ninth vacancy occurred by the decease of Dr. John H. Long. The chairman has declared the following nine of the nominees elected to fill the vacancies in the order of the votes they received. E. Fullerton Cook, William B. Day, Samuel L. Hilton, Henry P. Hynson, J. K. Lilly, Leonard G. Rountree, Leonard A. Seltzer, W. J. Teeters, Bernard Fantus.

Dean LaWall to Serve on Advisory War Board.—Dean Charles H. LaWall has accepted an invitation to serve as a member of the advisory board to the Division of Medical Industry of the War Industries Board.

Lieutenant-Colonel Dr. F. F. Simpson is Chief of the Division. Stated meetings will probably be held monthly in Washington, D. C.

Mr. H. K. Mulford Honored by Lafayette College.—At the annual commencement exercises of Lafayette College, Easton, Pa., the honorary degree of Master of Science was conferred upon Mr. H. K. Mulford, Vice-President of the H. K. Mulford Co., of Philadelphia.

Pennsylvania Board of Pharmacy.—The board gives notice that the next examination for registration as Pharmacist or Assistant Pharmacist will be conducted at the Williamsport High

School, Williamsport, Pa., on Friday and Saturday, August 30 and 31, 1918. Applications should be addressed to L. L. Walton, Secretary, P. O. Box No. 265, Williamsport, Pa.

At the recent examinations held in Philadelphia and Pittsburgh, there were 131 candidates for pharmacists' certificates of which 89 were successful and of the 150 examined for license as assistant pharmacists 88 passed the test.

THE COMPLAINT OF THE FEDERAL TRADE COMMISSION AGAINST ELI LILLY & CO.—The Federal Trade Commission has cited the well-known pharmaceutical manufacturing firm, Eli Lilly & Co., of Indianapolis, Ind., to appear before that body and defend themselves against charges of having violated certain sections of the Federal Trade Commission Act and of the Clayton Act. Exception is taken by the Commission to the method adopted by this firm in fixing standard jobbing and retail prices for its products and further that their methods discriminate in price between different purchasers of drugs and further that their contracts of sale contain agreements that the purchaser shall not use the wares of other manufacturers who are competitors.

The "discount sheet" to jobbers or preferred quantity purchasers and the "preference clause" have heretofore been very commonly in use in the drug trade as well as in many other lines of commerce and manufacturing. It would seem that some such method for stabilizing prices of standard wares and to assure the dealer a just remuneration has always been considered as a proper business method.

The outcome of this action will necessarily have an important bearing upon the future conduct of the drug business. While now the cause of considerable unrest and alarm to trade circles, these actions of the Federal Trade Commission will no doubt ultimately result in compelling the commercial interests of the country to see that Congress will enact laws that shall recognize correct and proper methods of merchandizing and the stabilizing of prices and at the same time protect against monopolistic profiteering and deceptive advertising and the unfair methods of price-cutting.

ANTOINE CHIRIS COMPANY ESTABLISHED ONE HUNDRED AND FIFTY YEARS.—In commemoration of the one hundred and fiftieth anniversary of the establishment of the house of Antoine Chiris at

Grasse, France, their American representative Mr. Burton T. Bush has compiled an interesting succinct history of their activities. This brochure of forty-two pages, with the cover plate "a monument to Leon Chiris erected by the citizens of Grasse, March 29, 1914," is a magnificent example of the printer's art, in style, paper, type, illustrations, press work and presentation of data.

In 1768, Antoine Chiris converted an old monastery, that had been built in 1600, into a factory to distill oils from the flowers and plants growing so prolifically in the vicinity of Grasse. One of the illustrations is a photographic reproduction of the first price-list issued in August of that year.

Through five generations this business has continued in the same family and has been progressively developed along scientific lines. Leon Chiris who at the age of eighteen in 1862 succeeded his father Leopold in the management of the business appears to have been especially active in the development. He purchased 18,000 acres in Algeria and established there an important branch of their manufacturing. To him is attributed the earliest adoption of steam boilers in the distillation of natural perfume oils. Despite his business energy and extensive industrial operations, he took an active interest in civic and political matters and served as a Senator from the Alps Maritimes, and was a Knight and Officer of the Legion of Honor.

In addition to its Grasse and Cannes factories in France and its extensive plantations and factory in Algeria, other factories have been established at Reggio, Italy, and Messina, Sicily, for the production of citrus oils and many agencies throughout the French colonial possessions for the collection of essential oils and perfume products.

The establishment of an American factory at Delawanna, N. J., has been one of the most recent achievements of this house. At this location, 14 acres have been acquired and since November, 1914, their factories situated here have been producing American essential oils, synthetic aromatic chemicals and some pharmaceutical products and "Capes Viscose" which as a capping material are growing in favor with our manufacturers.

The past illustrious history, the scientific basis on which the business has been established, and the business aspirations of the house of Chiris, all bespeak continuous progressive developments for many generations in the future.

THE AMERICAN
JOURNAL OF PHARMACY

SEPTEMBER, 1918

EDITORIAL.

THE PASSING OF THE PHARMACEUTICAL CALENDAR.

Meetings of many of the state associations for the calendar year 1918 have already been held and the recent meeting of the American Pharmaceutical Association marks another of the series of red-letter days on the pharmaceutical calendar. It is assumed that the records of accomplishments of the meetings of the various pharmaceutical associations for this year are fully up to the average and it is hoped that the results of these meetings may prove to be permanent benefits to pharmacy.

Presumably, there was some public need that called into existence every one of the pharmaceutical organizations in the United States and that such need of organization and of service was a more or less permanent one and the value of each association will be dependent upon the success attending its efforts to carry out the purposes of its organization.

At the Chicago meeting of the American Pharmaceutical Association, the question of a federation of all the pharmaceutical associations into one grand organization was discussed at a meeting of delegates representing the more important pharmaceutical and drug trade organizations. It was apparent that these represented many interests more or less diverse and incongruous. While in many matters of national importance their interests were in common, other subjects were of peculiar and particular consequence perhaps to only one of the organizations or trade interests.

The deliberations resulted in a conclusion to test out more fully the plan of coöperation on matters of universal interest to Pharmacy through the National Drug Trade Conference. The wisdom of this conclusion will probably be demonstrated and the germ of the federation idea, *intensified coöperation* on such matters of common interest, can be developed in this way. We are pleased to note that one of the decisions of the Drug Trade Conference was to get back of the movement to have a pharmaceutical corps established in the United States Army.

G. M. B.

THE STANDARDIZATION OF PHARMACY.

From time to time, arguments have appeared in pharmaceutical journals advocating that drug stores should be classified and that a differentiation should be made between those proprietors of drug stores that have established a professional standing as pharmacists and others who have devoted their efforts mainly to merchandising and the upbuilding of mercantile ratings.

The present trend of pharmaceutical thought is toward a classification by which the compounding of prescriptions and the dealings in potent medicaments shall be restricted to professionally educated pharmacists and the merchandising of the numerous commodities, very largely side lines, commonly sold in drug stores shall be left to another class of merchants who have not the necessary qualifications and education of the pharmacists. In many of the European countries such a method has been in vogue and the pharmacist or apothecary holds a distinctive position above that of the drug-store keeper and many other merchants.

A short time ago, it was seriously proposed that there should be established a class of "certified pharmacists." The questions naturally arose who was to have the authority for the certification and what should be the appropriate rules and regulations for such standardization? Pharmacists would not be willing to delegate such control and authority to a medical organization or to a politically appointed board and as no definite standard was available and the authority for such action was not vested in any body pharmaceutic, this project remained as an undeveloped proposal.

At the recent meeting of the Conference of Pharmaceutical Faculties, the President, Professor Henry Kraemer, took a pronounced stand in favor of the classification of dealers in drugs into two classes, the pharmacists or apothecaries and the druggists.

As a basic proposition, thoughtful pharmacists already have given consideration to this as a possible necessity to which they could willingly subscribe. The standard, however, that he proposes for such a differentiation would be a very misleading gauge whose results would be so fallacious as to entirely destroy the purpose of the proposer. While decrying commercialism, a commercial basis, nevertheless, is proposed to differentiate between the professional and the commercial drug dealers. The volume of business done and "a minimum compounding of prescriptions," "in which at least four thousand prescriptions are compounded within one year," would be very misleading criteria by which to determine the educational and professional qualifications of pharmacists. It not infrequently happens that the most capable pharmacists, professionally educated and thoroughly equipped, do not enjoy the largest patronage.

The successful pharmacist has to meet the requirements of his environment and supply the needs of the community in which his business is located. A young pharmacist who has had the advantage of a good preceptor and excellent store experience and who has graduated with honor from the college of pharmacy and readily passed the examination of the state board, engages in business in a very promising location. Filled with high ideals and a laudable ambition to excel in his profession, he takes pride in his model modern equipment for prescription compounding. His education, ability, skill and facilities all justify his expectations for a successful business career. After several years of close application to business, through no fault of his own, he is confronted with altered conditions beyond his control. A change has taken place in the character of the residents of his neighborhood. The old family homesteads may have become tenements filled with foreign born population or the encroachment of business may have converted the locality into a business thoroughfare with only transient trade or perhaps the locality may have become a "factory district." Moreover, the physicians in the neighborhood have ceased to write prescriptions and are now dispensing ready made medicines from their offices. Thus, by these urban changes and the unethical practice of medicine, fate decrees that to be successful in his business, he must adjust his professional ideals and aspirations to the changed conditions of his environment.

We fail to understand how the Boards of Pharmacy in such cases could give relief nor can we see how "the Boards of Pharmacy could make a ruling which would either *enable them to in-*

crease their professional work or cause them to see that the responsibility required for this did not give them an adequate remuneration for their pains" (italics mine).

The knowledge, equipment, skill and ideals have not been eradicated, but measured now by the yardstick proposed by the professor our model could no longer be classed as a pharmacist. Public sentiment and the laws of the land will have to be changed before such a standard for pharmacists as that proposed can be given serious consideration.

Much of the talk about "who are the pharmacists" and "what constitutes the professional work of the pharmacist," is twaddle. Our model pharmacist is performing just as useful service and as much a professional duty when he sells a nursing bottle or infant food as when he compounds a prescription for the baby and his advice to the young mother on these may be of greater benefit to the baby than the medicine. Many of the non-medicinal commodities supplied by the apothecaries have always been looked upon by the public as public necessities coming within the line of his purveying and in supplying these pharmacists are only fulfilling their legitimate purpose in the present status of society.

While admiring the attainments and the zeal and devotion to the cause of professional elevation of pharmacy of many of the members of the Conference we cannot refrain from calling attention to inconsistencies and radicalism that would defeat the very purpose for which they are striving. Their pedagogic ideals and the rarified esthetic atmosphere in which they live and the personal hobbies ridden, leads them to expect that a pharmacist must measure up to their ideals. To one research in pure science is indicative of professional standing as a pharmacist to another application to study along strictly laboratory work or clinical analysis would appeal as the essential. Their lack of acquaintance with the problems that confront the practical practicing pharmacist is too often too apparent and their limited actual experience under the strenuous conditions now confronting the apothecary all tend to make them hardly a safe guide to follow implicitly in matters outside of their special educational branch.

The second proposition submitted in this presidential address, namely, that the conference take measures to provide for the organization and conduct of two classes of colleges, the Colleges of Druggists and the Colleges of Pharmacy, will likewise merit careful consideration as to its feasibility. Who shall determine the lines of demarcation? The assumption on the part of the university faculties that they alone represent professional pharmacy is pure assumption. Unfortunate indeed would be the attempt on the part of these interests to differentiate between schools of pharmacy and to establish as a standard for a college of pharmacy affiliation with a university.

A common pedagogic error is for the teacher to imagine that he is the creator of the finished product. All that he can do is to lay an educational foundation and then the application, the ambition and the innate ability of the individual determines the success of his future career and his professional standing.

The teaching ability of the faculty, the equipment of the college and its facilities for imparting collegiate instruction in pharmacy in course and for post graduate study are better criteria, than mere association or affiliation with a university, for determining the feasibility of its giving higher pharmaceutical education.

The judgment of the teacher may be perverted by his zeal and ardor for a new order of things, but an opinion based upon experience and the established records of accomplishments is far safer to determine the practicability of any proposition. The lives of many of those to whom we have accorded honor as the past and present leaders in American pharmacy and as the foremost teachers in our schools of pharmacy are worthy of careful study in this respect. Moreover, many of those to-day sitting in the foremost rank of pharmacy are living examples of the possibility for study, for research and for self-development afforded by a college of pharmacy not associated at any time with a university.

This address is well worth the most careful perusal and study of every pharmacist and druggist and without at all minimizing the importance of the subjects treated therein, the writer would suggest that after this has been done that each reread that logical pharmaceutic classic by Dr. James H. Beal, "Facing the Facts."

Above all, let those who are striving for the true advancement of pharmacy, its evolution and elevation on an appropriate basis, fully recognize that too radical movements cannot succeed and that we are inhabitants of the Earth in an age of practical usefulness and that pharmacy will be gauged by the public in accordance with its fulfillment of its assigned field in the social economy.

G. M. B.

THE DANGER OF INCOMPETENT DISPENSING IN THE ARMY.

The mistake that occurred in an English Army camp hospital, by which a soldier was given carbolic acid in place of quinine mixture with a fatal result, demonstrates forcefully the danger to which the soldiers of Great Britain and the United States are subjected to by the lack of pharmaceutical corps and competent dispensers in the hospitals and encampments of these armies. The following account of the inquest in this case is copied from the *Pharmaceutical Journal and Pharmacist.*

INQUEST.

CARBOLIC ACID: DISPENSING IN A CAMP HOSPITAL.—At an inquest on Cadet Alexander Miller, R.A.F., before the South Bucks Coroner, on July 5, the evidence showed that death was caused by carbolic acid poisoning, the acid having been given in mistake for quinine mixture. The deceased was a patient in the camp hospital, and the fatal dose was given to him by another cadet, a voluntary worker in the hospital. Another voluntary worker, a lady, explained that she got the carbolic acid from the corporal at the dispensary in a sauce-bottle labelled "Quinine Mixture." The corporal deposed that the lady, whom he took to be a nurse, did not say what she wanted the carbolic acid for, but he inferred it was for cleaning or disinfecting purposes. He did not think about a poison label, being very busy at the time, and used the sauce bottle because bottles were very scarce. The jury, in returning a verdict of "death by misadventure" added that the corporal was very much to blame in not seeing that the bottle was labelled poison. In future they considered it essential that the camp should have a qualified dispenser. The coroner, who emphatically concurred in this recommendation, continued: "You know as well as I do that there are properly qualified chemists in the Army who are pushing barrows about, and that sort of thing, whereas they might be most usefully employed in their own important work."

The attention of those responsible for the lack of proper pharmaceutical service in our army, especially the Medical Department of the United States Army, is respectfully directed to this incident.

G. M. B.

"CHLORAMINE" ANTISEPTICS.[1]

By E. Fullerton Cook, Ph.M.

The wide-spread interest manifested by surgeons in army, hospital, and domestic practice, also by dentists, in the new antiseptics, known under the general name of "chloramines" would seem to justify a brief review of their present status.

These substances were originally proposed by Dr. H. D. Dakin[2] in 1915, and have since been extensively tested and improved.

The successful use of the various hypochlorite solutions in the treatment of war wounds, especially the famous Dakin-Carrel Solution, a neutral solution containing from 0.4 to 0.5 per cent. of sodium hypochlorite, resulted in a careful study of many of the phenomena observed with the result that several newer products have been developed, which seem to embody the advantages of this solution, but, in large measure, overcome its defects.

The primary objection to the Dakin-Carrel Solution was the necessity of maintaining this very unstable solution exactly within the strength limits mentioned. If stronger than 0.5 per cent., it became actively irritating, if weaker than 0.4 per cent., it no longer possessed active germicidal power. Then the small amount of active ingredient was soon exhausted in performing its desired function, and this required its constant renewal, elaborate apparatus, and much attention to insure results.

Furthermore, it was found that the skin surfaces about the wound, if allowed to come in contact with the solution, soon developed an annoying irritation, resembling ivy-poisoning, a condition persisting for months, while the solution in contact with the wound was apparently non-irritating if kept within the proper strength.

The investigation of Dr. Dakin and his collaborators led to the discovery that the hypochlorites apparently acted upon the proteins and other nitrogenous cell constituents with the development of chloramines, and these were non-irritating, but highly antiseptic.

The next step was an attempt to prepare suitable chloramines synthetically and the first practical substance discovered was the water-soluble para-toluene-sodium-sulphonchloramine ($CH_3 \cdot C_6H_4 \cdot$

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[1] Presented at the meeting of the New Jersey Pharmaceutical Association, Spring Lake, June, 1918.

[2] *Brit. Med. Jour.*, August 25, 1915.

$SO_2Na\ NCl + 3H_2O$), for which the names *Chloramine, Chloramine T* (T standing for toluene), or *Chlorazene,* the latter a trademarked name in this country, were variously used.

It was claimed for this substance that its solutions could be used in from ¼ to 4 per cent. strength without irritation, the 1 to 2 per cent. solutions being most largely used for wounds and the weaker solutions for nose and throat antisepsis, or for eye work.

In wound dressing, this solution required less frequent changing of the dressings as compared with the Dakin-Carrel Solution, was relatively permanent, and caused little or no irritation.

This substance has also been used in what is known as *Chloramine T Paste,* as suggested by Daufresne, in which 0.7 to 1 per cent. of Chloramine T is dissolved in a 7.5 per cent. paste of sodium stearate in distilled water. This product has proven to be very unstable and is not extensively used to-day.

It has long been recognized, however, that aqueous solutions are not entirely satisfactory for wound dressings, since they quickly dry and are difficult and painful to remove when new dressings are required, and in nasal and throat work are not sufficiently penetrating so that search was made for a chloramine which would be soluble in an oily solvent, which could be safely applied directly to wounds.

This was found in a closely related product, namely, para-toluene-sulphon-dichloramine, for which the title of *Dichloramine T* ($CH_3 \cdot C_6H_4 \cdot SO_2NCl_2$) was adopted without any trade-mark rights being allowed. This product is now manufactured in this country by a number of chemical firms and is recognized and standardized by the New and Non-official Remedies.

The first largely used solvent for dichloramine T was chlorinated eucalyptol, prepared by treating the official eucalyptol with chlorine and carefully neutralizing and drying the resulting product. As first prepared, Dr. Dakin recommended the chlorination to be accomplished by adding potassium chlorate and hydrochloric acid directly to the eucalyptol and, after twelve hours, removing all traces of acid and free chlorine by suitable treatment and subsequently drying by shaking with calcium chloride. Liquid petrolatum was chlorination in a similar manner and was used as a diluent for the concentrated eucalyptol solution of dichloramine T, the dilution being made just before applying to the wound.

Another form of chlorinated eucalyptol was later developed known as "chlorinated eucalyptol 1.2." This was prepared by passing dry chlorine into eucalyptol until the specific gravity became 1.2 and the viscosity greatly increased.

It was the usual custom to prepare 10 per cent. solutions of dichloramine·T in the prepared eucalyptol and diluting only when required and if kept absolutely dry and in amber colored bottles, protected from the light, they remained undecomposed for a month or even longer, under favorable conditions.

If, however, this solution was placed in a damp bottle or exposed, even for a short time, to the light, rapid decomposition resulted, a precipitate of para-toluene-sulphonamide formed, free chlorine was liberated, and the solution became intensely irritating.

Even under the most favorable conditions of freedom from moisture and light, the dilution quickly decomposed so that the surgeon was advised to never use the dilute solution after twenty-four hours and to then carefully wash out all traces of the old solution from atomizer and graduates with the use of chloroform or carbon tetrachloride.

These earlier solvents having proven so difficult to handle and their solutions so unstable, Dr. Dakin again endeavored to correct the defects through many experiments and has now proposed a much more satisfactory solvent and one, fortunately, which is less costly. This substance is known under the title *Chlorocosane,* a title which is not trade-marked and is being used by all manufacturers.

This substance is prepared by passing chlorine into melted paraffin, carefully maintaining the temperature between 125° and 140° C., until the product has increased from 45 to 55 per cent. in weight, when it is shaken with sodium carbonate, to neutralize the hydrochloric acid which has developed, and is afterwards filtered.

The name of this product is derived from the fact that paraffin belongs to the open-chain series of hydrocarbons, this member of the series showing twenty or more carbon radicals and that in this compound, a portion of the hydrogen is replaced by chlorine. The analyzed name therefore shows the "ane," the ending adopted for hydrocarbons of the open-chain series, the "cos" meaning twenty, and the "chlor" indicating the chlorination.

In this solvent the dichloramine T is quite stable, if kept dry and unexposed to light and out of contact with metals. In preparing the solution, which is usually used in 5 per cent. strength for wounds and in 1 to 2 per cent. for nasal and throat treatment, the dichloramine T is usually dissolved in about one-fourth of the solvent with the aid of heat, and then quickly cooled by adding the remainder of the chlorocosane.

In applying any of the solutions of dichloramine T very light and open dressings are used and all metallic apparatus must be avoided. The solution is preferably sprayed upon the wound from an all-glass atomizer and this is particularly worthy of adoption because of its economy since only small quantities of the antiseptic are required.

A great advantage of this material is the fact that the dressings do not necessitate changing more often than once in twenty-four hours due to the slow liberation of chlorine which continues over an extended period.

Another closely related product which has been placed upon the market is the para-sulphone-dichloramine benzoic acid, known to the trade as halazone ($C_6H_4(SO_2NCl_2)COOH$). This substance is used for sterilizing drinking water in the proportion of 1 part to about 300,000 parts of water, and complete destruction of all organisms results within about sixty minutes.

It is sold in tablets and each of these, containing about ⅛ grain of halazone combined with a small amount of sodium carbona e and sodium chloride, will quickly destroy all organisms in 1 liter of water and render it safe for drinking purposes.

All of these products may be assayed by the well known method used for chlorine products, using a tenth-normal sodium thiosulphate volumetric solution, 10 per cent. potassium iodide solution, and diluted acetic or hydrochloric acid and calculating for the indicated per cent. of chlorine.

In their development and demonstration of usefulness, credit is due Dr. Dakin and many collaborators, chief among whom were Drs. E. K. Dunham, J. B. Cohen, of the University of Leeds, J. Kenyon, of the British Medical Research Committee, Capt. W. E. Lee, Capt. W. H. Furness, Capt. J. E. Sweet, of the United States Army Base Hospital No. 10, and others.

List of Exhibits.—Tablets of Chloramine T (Chlorazene), powdered Dichloramine T, chlorinated Petrolatum, chlorinated Eucalyptol, 10 per cent. solution of Dichloramine T in chlorinated eucalyptol (fresh), 10 per cent. solution of Dichloramine T in chlorinated eucalyptol (decomposed), Chlorcosane. All-glass atomizer devised for spraying oily solutions of Dichloramine T. (Made by Randall-Faichney Co., Boston, Mass.)

VARIATIONS IN NUX VOMICA AND ITS PREPARATIONS.[1]

By Hugo H. Schaefer.

One of the more important changes in the U. S. P. IX as compared to the former revision is that of the alkaloidal requirement for nux vomica and its assay process. The former requirement called for 1.25 per cent. strychnine and in its determination the well-known assay process was used in which the total alkaloids are extracted, the brucine destroyed, by means of nitric acid and the remaining alkaloid calculated as strychnine. In the U. S. P. IX the requirements are for 2.5 per cent. total alkaloids and the assay process is of course based on the simple extraction and titrating of all the alkaloids of nux vomica.

It was found by the author that a greater percentage of samples of nux vomica met the requirements of the new pharmacopœia than that of the old. In other words that 2.5 per cent. total alkaloids was a lower standard than 1.25 per cent. strychnine. In order to definitely determine this question a number of samples of powdered nux vomica were taken and assayed according to the U. S. P. IX for total alkaloids. After titrating the latter the solution was made alkaline with ammonia water, completely shaken out with chloroform, the latter evaporated and the residue taken up with 15 mils of 3 per cent. sulphuric acid. This solution was now treated with nitric acid to destroy the brucine and the assay completed as described in the U. S. P. VIII, for the determination of strychnine. This data so obtained gave the total alkaloidal content, the percentage of brucine and that of strychnine in nux vomica, it being taken for granted that the other alkaloids present appear in so small a quantity as to justify their not being considered. The results obtained were as follows:

[1] Presented at the meeting of the New Jersey Pharmaceutical Association, Spring Lake, N. J., June, 1918.

Powdered Nux Vomica: U. S. P. VIII = 1.25 per cent. strychnine.
U. S. P. IX = 2.5 per cent. total alkaloids.

Sample.	Total Alkaloid Method U. S. P. IX.	Strychnine Method U. S. P. VIII.	Brucine by Difference.
A	2.64	.88	1.76
B	2.93	1.32	1.61
C	2.52	.73	1.79
D	1.92	.73	1.19
E	2.97	1.54	1.43
F	3.21	1.25	1.96
G	2.71	1.30	1.41
H	3.53	1.30	2.23
I	2.38	1.26	1.12

A number of interesting points may be obtained by studying these results. Of the nine samples all but two would come up to the requirements of the U. S. P. IX while three would not meet those of the U. S. P. VIII. Samples A and C would pass U. S. P. IX but not U. S. P. VIII. Sample D would pass neither the old nor the new requirements while sample I would pass the U. S. P. VIII and not IX. There, therefore, seems to be absolutely no relation between the percentage of total alkaloid and that of strychnine. The percentage of strychnine in the total alkaloid varies from 33 to 53 per cent.

Samples of fluid extract and tincture of nux vomica were now taken at random and assayed in similar manner as before described, first in accordance with the U. S. P. IX to determine total alkaloid, and the final solution after titration, was shaken out with chloroform and the strychnine determined according to U. S. P. VIII with the following results:

Fluid Extract: U. S. P. VIII = 1 per cent. strychnine.
U. S. P. IX = 2.37–2.63 per cent. total alkaloids.

Sample.	Total Alkaloid Method U. S. P. IX.	Strychnine Method U. S. P. VIII.	Brucine by Difference
A	2.46%	.79%	1.67%
B	2.64	1.27	1.37
C	2.51	1.03	1.48
D	2.39	.91	1.48
E	2.41	1.21	1.20
F	2.48	.77	1.71

EXTRACT: U. S. P. VIII = 5 per cent. strychnine.
U. S. P. IX = 15.2–16.8 per cent. total alkaloids.

Sample.	Total Alkaloid Method U. S. P. IX.	Strychnine Method U. S. P. VIII.	Brucine by Difference
A	15.41%	4.93%	10.48%
B	16.32	6.69	9.63
C	14.89	5.21	9.68
D	17.1	8.21	8.89
E	15.61	6.71	8.9
F	16.45	6.01	10.44

TINCTURE: U. S. P. VIII = 0.1 per cent. strychnine.
U. S. P. IX = 0.237–0.263 per cent. total alkaloids.

Sample.	Total Alkaloid Method U. S. P. IX.	Strychnine Method U. S. P. VIII.	Brucine by Difference.
A	0.241%	0.111%	0.130%
B	0.271	0.084	0.187
C	0.213	0.079	0.134
D	0.224	0.114	0.110
E	0.251	0.080	0.171
F	0.249	0.102	0.147

Again the results show that there is absolutely no relation between the percentage of total alkaloid and that of strychnine and some of the samples while meeting the requirements of our present Pharmacopœia show a decided deficiency in strychnine content as required by the U. S. P. VIII.

The question therefore suggests itself whether it would not be better to have both a requirement for total alkaloid and for strychnine. Considering the results obtained from the powdered nux vomica, sample C contained 2.52 per cent. total alkaloid and yet is of decidedly inferior quality since it only contains 0.73 per cent. strychnine. On the other hand sample I contains 1.26 per cent. strychnine but only 2.38 per cent. of total alkaloids therefore also of inferior quality. In the opinion of the author no difficulty would be had in obtaining nux vomica on the market, which contains at least 2.5 per cent. total alkaloids and 1.25 per cent. of strychnine. The combination assay process as suggested before could be used thereby requiring only one sample for the entire assay and making it little more difficult and complex than the assay of the U. S. P. IX.

A NEW AND NOVEL METHOD OF DETERMINING THE AMOUNT OF METHYL ALCOHOL IN MIXTURES OF ETHYL AND METHYL ALCOHOL.[1]

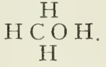
By William G. Toplis.

Several years ago, a company was formed in Philadelphia for the production of denatured alcohol, by a process that held certain advantages in economy of manufacture, on the one hand and, upon the other, freedom from domination by the trusts producing wood alcohol. The company, among whose stockholders were five Philadelphia druggists, devoted much time and great efforts to make a going concern of this enterprise. Opposition appeared in several quarters, of which the most important was that in the office of the Commissioner of Internal Revenue. It developed that the proposed process was in conflict with certain inflexible rules for the conduct of fermentation industries, and one particularly serious objection was set forth as follows in the exact wording of the then Commisisoner of Internal Revenue, R. E. Cabell: "The matter of standardizing the product or permitting it to pass into common use without analysis of every part of it, which is a slow and expensive process has already been called to your attention." This meant that we must discover some ready process for determining the amount of methyl alcohol in the mixture of ethyl and methyl, and the said process must be rapid, inexpensive and capable of operation by one of ordinary intelligence, not a trained chemist. It was an original problem, with several troublesome conditions—that required a radical departure from all familiar paths.

To begin, therefore, let us consider the basic difference between the two alcohols here set forth in graphic formulæ:

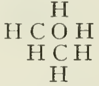
mol. 12
wt. 16
Methyl alc. ... 4
32

Methyl alc.



$$\begin{array}{c} H \\ H\,C\,O\,H. \\ H \end{array}$$

Ethyl alc.



$$\begin{array}{c} H \\ H\,C\,O\,H \\ H\,C\,H \\ H \end{array}$$

34 mol.
16 wt.
6
46 ethyl alc.

At a glance these formulæ show that there is considerable more material in the molecule of ethyl alcohol than that of methyl alcohol —at the same time they show but one hydroxyl in each formula.

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[1] Presented at the annual meeting of the Pennsylvania Pharmaceutical Association, Wilkesbarre, June, 1918.

It is possible from such a compound to set free the hydrogen of the hydroxyl by replacing it with an easily oxidizable metal such as sodium.

Thirty-two parts by weight of methyl alcohol treated with metallic sodium yield exactly the same weight or volume of gas as would be yielded by forty-six parts of ethyl alcohol under identical conditions. However, if equal weights of the two alcohols are subjected to this treatment, very different weights or volumes of gas are set free and this forms a positive means of differentiating between the two alcohols. The fact is that methyl alcohol yields nearly twice the volume of gas that an equal amount of ethyl alcohol gives.

When methyl and ethyl alcohols are mixed and so treated the yield of gas is exactly in proportion as the alcohols are mixed.

The alcohols must be dehydrated which is accomplished by treating a small portion of alcohol with a very large excess of fused potassium carbonate.

The above statements are true of chemically pure alcohols but commercial varieties have higher alcohols associated with them which also react with sodium and yield gas in a different ratio as their molecular weight varies. This fact operates against this method as a precise laboratory operation, but does not affect its application in the work for which it is designed, namely, to protect the government formula by indicating a minimum. The higher alcohols likely to be present in such mixtures have but one hydroxyl also but their molecular weights are still higher than ethyl alcohol. This would indicate as a deficiency of wood alcohol in any test and require further additions possibly, to make the tested alcohol satisfactory. Acetone which is also present in the denatured alcohol does not react with sodium, as there is no hydroxyl in its composition, its presence however indicates against the test and in favor of the government formula. While such impurities must be mentioned to completely cover the subject, their presence from a practical point of view is almost negligible because of the small percentage present.

Apparatus.—Having grounded our theory in substantial fact, apparatus for carrying it into effect becomes our next consideration. From the preceding remarks it will be learned, first, that we hope to set free hydrogen gas from the mixed alcohols; second, to collect this freed gas; third, to measure the gas; fourth, to carry out these observations upon a known, previously prepared standard denatured alcohol; fifth, to conduct the same experiments upon an equal volume of the alcohol to be tested, and to compare the result of the unknown with that of the known standard.

To successfully prosecute this plan, we found it necessary to provide two hydrometer jars of at least 1,000 Cc. capacity, two 50 Cc. graduated burettes graduated in 1/10 Cc., two small test-tubes on foot.

The remainder of the apparatus, which is simple, was required to be originated and produced by us, as follows: two perfect corks to fit the small test-tubes on foot, two 10-inch lengths of 1/8-inch thin wall, brass tubing. Perforate the corks and insert one end of each brass tube into the cork perforated for it. Pass the brass tubing entirely through the cork until its end comes even with the cork surface, make a tight joint by sealing with hot fused shellac or sealing wax; upon the opposite end of each of the brass tubes mount a trap that will permit gas to escape, but prevent liquid from entering—and be sure that the trap is not too large in diameter to enter the bore of the graduated burette.

If now the test-tubes are corked with the tubes as described they may be submerged in liquid without risk of any of the liquid passing into the interior—whereas, any gas generated within the test tubes could readily force passage through the brass tube and out through the trap surmounting it, to be finally collected for measurement in the burette, inverted over all.

These are the main requirements, but to operate them accurately it was also found necessary to provide further a weight secured to the foot of the test-tube to sink and stabilize it in the liquid when submerged. Also we adopted as a means for introducing the metallic sodium, a large darning needle with an eye through which passed a length of sewing silk. The silk passed through the brass tube out through the trap—down along the outside of the brass tube where it was secured near the cork by a spring clip, so arranged that it released the thread when the burette was inverted over all and pressed down ready for a reading.

The releasing of the thread permitted the needle to fall into the test tube which contained the alcohol to be tested. The pointed end of the needle carried a piece of metallic sodium in large excess. The needle was weighted to insure prompt action. By this arrangement no action occurred until everything was set and ready for it.

Burettes as produced for other operations need correction in one particular. Unless one end is corked, gas would pass through it. Therefore, secure a sound well-fitting cork which push into the burettes with a rod, until it registers at zero and forms the roof of the collecting cylinder when in operation.

Operation.—The gas in this case, like all others, is collected over a fluid. In this instance, however, certain precautions must be observed. We are working with the highly oxidizable metal sodium, this forbids any watery liquid, in addition to the other fact that our alcohol must be anhydrous. This suggests then a hydrocarbon oil as the most appropriate liquid. For the sake of cleanliness and rapid action, the oil should have the lowest viscosity. Therefore, our choice fell upon ordinary gasoline as meeting the conditions best of all.

Both hydrometer jars are filled to a convenient depth with gasoline. Into one of the small test-tubes drop from a pipette six drops of the prepared standard alcohol previously dehydrated. Cork it at once as previously described. Submerge it in the gasoline contained in one of the hydrometer jars. Now fill one of the burettes with gasoline, close it with the operator's thumb, be sure there is no bubble of air. invert the burette and place the end beneath the gasoline in the hydrometer jar, remove the thumb and carefully guide the burette, containing its column of gasoline intact, over the trap and down over the brass tube. When it encounters the spring clip, the silk thread is released, the needle bearing the sodium drops into the alcohol. The reaction begins at once, and the hydrogen forces its way out through the trap, is collected in the burette where it is read in cubic centimeters and fractions thereof.

The unknown alcohol is treated in precisely the same way, using the same number of drops and from the same pipette.

If the reading of the unknown sample is less than that of the standard it is deficient in wood alcohol. If greater, the wood alcohol is in excess of the requirement. If the two operations are conducted side by side, all considerations of temperature, barometric pressure, etc., may be ignored as they are identical in each instance.

Dr. Charles A. Crampton, a former Chief Chemist of the Internal Revenue department, after witnessing a demonstration of this method and apparatus, appeared at a hearing before the Ways and Means Committee and testified that "There is in existence a simple method and apparatus that is capable of proving denatured alcohol within the government requirement—also Mr. Peter Valear, assistant to the Chief Chemist of the Internal Revenue was detailed by Doctor Adams, the present chief, to witness this method of disclosing the amount of methyl alcohol in mixed alcohols.

The major portion of a day was devoted to trials of the apparatus. The conclusions were that the principle and operation were worthy of consideration. The glass apparatus was thought too fragile. It is interesting to note in this series of tests, the apparatus functioned with such precision that it detected the difference between commercial and C. P. wood alcohol in one of the mixtures prepared by Mr. Valear.

Congress is so occupied with war legislation that less important considerations are deferred. However, we hope to have the privliege of producing low cost denatured alcohol in which denaturing substances will be sufficiently prominent and deterring and permitting smaller additions of costly wood alcohol.

THE MANUFACTURE OF ASPIRIN TABLETS.[1]

By Robert C. White, Phar.D.

In *The Pennsylvania Pharmacist* Volume 1, number 2, under date of April, 1918, I was quite interested in the suggestion number 20 reading, "What has been your experience with the various aspirins, and aspirin tablets, which have been offered by the various American manufacturers."

Being a manufacturer, and consequently thinking along those lines, and having done considerable work from a manufacturing standpoint with regards to aspirin, the thought came to me that perhaps a paper dealing entirely with the manufacturing side of aspirin tablets would be of as much interest as are the various complications and problems arising from the presenting by manufacturers of several different makes of aspirin tablets with regard to merchandising. I, therefore, present for your consideration the following data obtained from investigation of the original aspirin tablets, and those of several prominent American houses without any regard whatever to the content of aspirin from a chemical standponit, but purely from tests involving the physical operation of making an aspirin tablet. As these tests were made from tablets of different manufacture and as various manufacturers improve their product from time to time—as such improvement becomes possible,—it would be unfair to give the name of the manufacturer in any of the following cases. We will, therefore, in our future consideration designate them by number.

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[1] Read before the meeting of the Pennsylvania Pharmaceutical Association, Wilkesbarre, June 27, 1918.

Date—May, 1918.
Samples—No. 1.
Appearance—Poor. *Die*—Satisfactory. *Punch*—Poorly engraved.
Color—Good.
Monogram—Indistinct.
Carrying Qualities—Very poor.
Disintegration—Good.
Disintegrating Agent—Potato starch.
Uniformity of Weight—Poor. *Maximum wt.*—7.3. *Minimum wt.*—4.7.
Excipient—Weak starch paste.
Other Filler—Corn starch.
Lubricants—Oil, none. Talcum
Contamination—None.
Packing—Fair.

Date—May, 1918.
Samples—No. 2. Eastern manufacture.
Appearance—Fair. *Die*—Poor. *Punch*—Plain.
Color—Fair.
Monogram—None.
Carrying Qualities—Good.
Disintegration—Good.
Disintegrating Agent—Potato starch.
Uniformity of Weight—Average good. *Maximum wt.*—6.4. *Minimum wt.*—5.7.
Excipient—Weak gum solution.
Other Filler—Corn starch.
Lubricants—Oil, small amount. Talcum, large quantity.
Contamination—Iron.
Packing—Poor and loose.

Date—June, 1918.
Samples—No. 3. Eastern manufacture.
Appearance—Poor. *Die*—Good. *Punch*—Very poor.
Color—Dark.
Monogram—Poor, engraving worn.
Carrying Qualities—Poor.
Disintegration—Fair.
Disintegrating Agent—Corn starch.

Uniformity of Weight—Poor. *Maximum wt.*—7.7. *Minimum wt.*—5.3.
Excipient—Gelatin solution.
Other Filler—Starch.
Lubricants—Oil, large quantity. Talcum, large quantity.
Contamination—Bad, evidently iron stains.
Packing—Poor.

Date—June, 1918.
Samples—No. 4. Eastern manufacture.
Appearance—Good. *Die*—Good. *Punch*—Plain, good.
Color—Very good.
Monogram—None.
Carrying Qualities—Good.
Disintegration—Good.
Disintegrating Agent—Potato starch.
Uniformity of Weight—Good. *Maximum wt.*—6.2. *Minimum wt.*—5.9.
Excipient—White dextrine.
Other Filler—Potato starch.
Lubricants—Oil, none. Talcum, ⅛ gr.
Contamination—None.
Packing—Good, in glass only.

Date—June, 1918.
Samples—No. 5. Middle West manufacture.
Appearance—Good. *Die*—Good. *Punch*—Plain and good.
Color—Good.
Monogram—None.
Carrying Qualities—Fair.
Disintegration—Fair.
Disintegrating Agent—Potato starch.
Uniformity of Weight—Good. *Maximum wt.*—6.4. *Minimum wt.*—5.7.
Excipient—Evidently tragacanth.
Other Filler—Corn starch.
Lubricants—Oil, small quantity. Talcum, ¼ gr.
Contamination—None.
Packing—In glass, good.

Date—June, 1918.
Sample—No. 6. Middle West manufacture.
Appearance—Fair. *Die*—Badly worn. *Punch*—Plain and good.
Color—Poor.
Monogram—None.
Carrying Qualities—Good.
Disintegration—Fair.
Disintegrating Agent—Corn starch.
Uniformity of Weight—Poor. *Maximum wt.*—6.6. *Minimum wt.*—5.3.
Excipient—Evidently gelatin; or gelatin and gum acacia.

Other Filler—Corn starch.
Lupbricants—Oil, entirely too much. Talcum, very heavy.
Contamination—With metal apparent.
Packing—Good.

Tablets on account of excessive pressure would not disintegrate speedily enough, yet their fracture was soft.

Date—June, 1918.
Sample—No. 7.

Purchased in a Washington, D. C., drug store. Name of manufacturer could not be obtained, had evidently been heated too long in drying, with apparent contamination. The edges were poor and the tablets quite mottled, as if too dark a shade of talcum had been used.

This sample was so far out-classed by those of other manufacturers that it is of no interest whatever except that it tends to show that very poor workmanship in pharmaceutical products still is practiced.

The manufacture of aspirin tablets may be placed in what is considered by manufacturers the delicate group. Many things coming in contact with aspirin can exercise either physical, or chemical function, and so either contaminate or break down the aspirin content. In the manufacture of any tablet there are several important features to which the manufacturer gives considerable attention. The first desirable thing is to present in tablet form the chemical as nearly in its original condition as is possible. The second important thing is disintegration, though in the case of aspirin this is not vital as it takes, according to various authorities, about forty minutes for aspirin to become decomposed in the gastric fluids (U. S. Dispensatory, 20th edition). The next feature is to have present as little foreign ingredients as is possible. As we know there are many materials such as formin, potassium iodide, sodium chloride, sodium bicarbonate, permanganate of potash, sugar, etc., which if obtained in granular form of the proper size may be compressed without the use of any excipient, or binder, without the presence of any filler, and without the addition of any disintegrating agent whatever. The physical properties of aspirin are such that it is placed in a class of tablets known to some manufacturers, as moist tablets. This class includes such tablets as quinine, acetanilide, etc., or tablets which can never be produced with a glass-like surface. The term moist in this case originated with the appearance of the tablet, which no amount of blowing, or dusting, will make entirely smooth. Such tablets if great pressure is applied are inclined to cap; or on account of their sticky surface allow small particles to adhere to the punches thus leaving dents in the surface of the tablet. This to the manufacturer is known as "picking," meaning that the punches pick off a small particle, leaving a cavity in the tablet. It will be readily seen from the physical properties of aspirin that it is necessary to have present a binder, or excipient. Sugar has not proven satisfactory for this purpose as sugar itself attracts moisture, and complicates the operating of a compressing machine. It must also be remembered that moisture decomposes aspirin, and its presence in large quantities is highly objectionable, therefore the excipient must be one that can be dried very readily and that, at a low temperature. Glucose, gelatin and tragacanth all fail to answer on account of their sticky and slow drying qualities. Honey would not answer as its tendency is to darken white tablets, and the need of much filler makes it unsuitable. Water alone will not bind properly. Solution of acacia answers fairly well but both starch paste and acacia are lacking in making a fine aspirin tablet. It will, therefore, be found that a weak solution of white dextrine in combination with a filler of starch answers better than any other excipient for producing a mass of aspirin for proper granulation. It might here be explained for the information of the unitiated that except in extremely rare cases it is never possible to compress powders of fine degree, but that granules must be built up from the powder.

Another feature involved in the preparing of an aspirin mass or mixture is that it must not be exposed to contamination from metals. From the samples examined it is evident that some of these have been manufactured in the ordinary iron mixers, or if graniteware containers have been used the surface has not been perfect, and iron has been exposed. If this is not the case the moist mass, before drying, has evidently been forced through a brass, or an iron screen, which has produced contamination, and resultant discoloration. In this particular product the writer has found nothing more satisfactory than the mixing of the aspirin ingredients in a special wooden tub made of maple. The operator may mix the dry ingredients through a properly protected powder mixer, but the addition of the dextrine solution must be made in these wooden tubs, the operator wearing long rubber gloves. Care should be exercised in all cases that the minimum amount of moisture, for the best results to be obtained, shall be strictly adhered to. The finished mass taken from these wooden tubs should be forced very quickly through perfectly clean and well tinned screens, placed immediately in aluminum trays, and dried in vacuo at a temperature not exceeding 120° F.

It will be found if all these rules are observed that aspirin may be dried in three or four hours. If during this time the aspirin has not been exposed to the air it will be found that the granulation dry and ready for compression is in proper condition to be placed on the presses. No oil should be added in the running of aspirin tablets, unless absolutely necessary, on account of weather conditions. It will be found that though on account of the absence of oil the sides of the tablets will not be bright and polished (due to the moist physical properties of the ingredients as spoken of earlier) the edges will be sufficiently smooth for all purposes; and the absence of the oil (which would in time penetrate the tablet) will permit of a harder tablet.

A minimum amount of pure white talcum not exceeding ⅛ gr. to the tablet must be used as otherwise picking on the surface of the tablet will occur. If the engraving of monogram punches is very fine it will be necessary to increase the amount of talcum in order to prevent the material from sticking in the engraving. It should be borne in mind that talcum is objectionable in all cases and as little as possible should be used.

As speedy disintegration of all tablets is considered essential, a disintegrating agent must be used. Doubtless, known to many, potato starch is the disintegrating agent par excellence as it swells very rapidly and ruptures a tablet very quickly when it is introduced into aqueous solution.

The following criticisms in general might be based on the aspirin tablets at present supplied by all except one or two manufacturers; that many of them are off color, some having unquestionably been subjected to contamination. Corn starch has been used by many in preference to potato starch, the excipient used by some is also too heavy and too slow drying.

The nature of engraving used on such monogram punches as have been operated in making aspirin tablets is not of a proper make to use on tablets of such dusty physical appearance. Others through not using a proper disintegrating agent have compressed the tablets too hard, which makes them too brittle for carrying. In other cases to permit of speedy disintegration insufficient pressure has been applied.

In behalf of the tablets examined, however, the writer would like to state that the disintegration in general has been exceptionally good, the discoloration only moderately bad, and that while the appearance of most of the tablets is poor it is undoubtedly preferable to sacrifice physical appearance for efficacy in all cases and when all is said and done it is quite probable, too, that though these matters are of considerable importance to manufacturers the retail druggist may be in a position to inform us that the public are not sufficiently educated in such details, and may prove to us that the poorest looking tablet is the best seller of all.

SERVICE—THE BEST METHOD FOR INCREASING PRESCRIPTION DISPENSING.[1]

By Robert P. Fischelis and Hugo H. Schaefer.

The prime factor governing the increase of prescription dispensing is undoubtedly service.

The pharmacist who best serves the medical profession through careful conscientious and up-to-date dispensing will be sought out and patronized even though, as Emerson might have said, he built his shop in the wilderness.

What constitutes the right kind of service to the medical profession and how can it be given most effectively? Pharmacy is the handmaiden of medicine and service to the medical profession, implies an expert knowledge of drugs and medical supplies and the ability to apply this knowledge practically to the problems of the day. First, then, to give proper service the pharmacist must be educated and when we refer to education we include not only the regular college course but the annual postgraduate courses, offered to the pharmacist through his state and national associations. To give the right kind of service the pharmacist must be up-to-date and a little in advance of the average physician, dentist and veterinarian if possible, in his knowledge of the newer materia medica products. He should attend meetings of medical associations, where possible, and by all means read at least one medical, dental and veterinary journal. Educating the doctor to depend on the druggist for reliable information regarding drugs is not only practising true pharmacy but it is building business.

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[1] At the forty-eighth Annual Convention of The New Jersey Pharmaceutical Association this paper was awarded the $25.00 prize offered for the best paper on "How to Increase Prescription Business."

No surgeon can be successful without the proper instruments and facilities with which to work and no pharmacist can serve the physician or his community without proper equipment. Under equipment we include first: a stock of reliable drugs, chemicals and biological products, either accurately prepared and standardized by the pharmacist himself or purchased from absolutely reliable sources. The pharmacist who can supply the physician with the things he needs when he needs them, other things being equal, should have no fear of physicians' supply houses or even dispensing doctors. Secondly, under the heading of equipment we should include laboratory facilities. This should embrace apparatus for the more common clinical tests but by all means it must include the necessary apparatus for compounding all common and uncommon prescriptions. In the latter classification we include facilities for filling ampuls, sterilization, making titrations, isotonic solutions, etc.

Many doctors are considered cranks because of their insistence on special kinds of service. These are the men to please, for once they feel satisfied with your service nothing will drive them away from you and they become wonderful assets to your prescription department. Incidentally anyone who can please a crank need have little fear of not pleasing the average man.

Quick service and ability to meet unusual requirements are factors which every doctor appreciates and are producers of confidence. A pharmacist may have the stock; equipment, personality and all the other attributes of a successful prescription dispenser but in order to be successful he must not fail to also adopt modern methods of keeping physicians, dentists and veterinarians informed of the fact that he is in step with the progress of the times. An occasional letter, just as personal as acquaintance with these men permits, is one of the best mediums for keeping in touch with the medical man.

It is very important to bring the professional side of the pharmacy to the front if prescription dispensing is to be increased. Show the medical men that only registered pharmacists compound their prescriptions in your store; show that you follow directions for storing and preserving the drugs and biological products prescribed. If the medical man is a specialist talk to him about his specialty and demonstrate that you know the requirements of his branch of medicine as far as drugs and other supplies are concerned.

Do not overlook the fact that dentists and veterinarians are also prescribers and that they would be greater prescribers if you kept them informed of the service you are able to render.

Remember that the busy doctor sees many patients each day and you can lighten his burdens by informing him that you have some one competent at hand at all times to receive his prescriptions over the telephone.

Coöperate with him as far as possible in limiting the promiscuous renewal of prescriptions. Give him practical pointers on conservation of supplies in these times of need and offer suggestions to improve his prescribing. Needless to say the two things just mentioned must be done very tactfully or they will defeat their purpose.

Having earned the physician's confidence and respect, you have given a large part of the service which must be provided to increase prescription dispensing.

One thing still remains and that is a realization of the fact that your success as well as that of the prescriber depends on the service that is rendered to the sick. When you have gotten the prescriber to the point where he sends all his prescriptions to your store, you must bear in mind that the impression you create on the customer determines the ultimate increase or decrease in your prescription business.

Service to the customer is a subject in itself and should be considered as a separate topic.

The best method of increasing prescription dispensing and the one which underlies all others is service to the medical professions.

CONTRIBUTION TO THE CHEMISTRY OF GOSSYPOL, THE TOXIC PRINCIPLE OF COTTONSEED.[1]

By Frank E. Carruth.

(*Contribution from the Chemical Division of the North Carolina Experiment Station.*)

Gossypol is a peculiar coloring matter present in the cotton plant. Apparently it does not belong to any known class of plant pigments. Its relation to cottonseed poisoning has been shown by Withers and Carruth[2] in separate publications on the subject. At present gossypol is of negative economic value, but it is possible that it may prove useful in the future.

Historical.—The first published work on this substance seems to be by F. Kuhlmann.[3] Kuhlmann was attempting to recover fatty acids from the "degras" or "foots" of cottonseed-oil purification. After distilling off most of the fatty acids by superheated steam, a greenish-blue mass was left behind, from which he obtained a substance later called "cottonseed blue" by dissolving out the fatty acids with naphtha, to which he gave the formula $C_{17}H_{24}O_4$. This substance prepared by Kuhlmann differs considerably from pure gossypol in composition and properties and perhaps consisted of a mixture of gossypol with its oxidation products and fatty acids.

A substance known as "gossypin" has been prepared from the foots of cottonseed oil. This substance is described[4] as a light brown pungent powder and evidently consisted of gossypol with certain odorous impurities. Probably this description is based on the work of J. Longmore[5] who, however, does not give his substance any name.

Under the title of "Cottonseed Oil, Its Coloring Matter and Mucilage," J. Longmore describes the preparation of the coloring matter from crude cotton oil:

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[1] Abstract of paper in *The Journal of the American Chemical Society*, April, 1918.

[2] *J. Agr. Research*, 5, 261 (1915); *J. Biol. Chem.*, 32, 245 (1917); *J. Agr. Research*, 12, 83 (1918), and a fourth paper to appear soon.

[3] *Compt. rend.*, 53, 444 (1861).

[4] Cf. Julius Wiesner, "Die Rohstoffe des Pflanzenreiches," 1903, 2d edition, p. 754.

[5] *J. Soc. Chem. Ind.*, 5, 200–6 (1886).

> Crude cottonseed oil is of an intense ruby, nearly black color due to its holding in solution a powerful vegetable coloring principle. This latter, according to the results obtained by the author, amounts to 10 to 15 pounds per ton of oil. . . .
>
> This coloring matter has now been isolated by the author with the result of throwing some light on its nature. In the dry state it is a light powder of pungent odor, of a brown earthy color and possesses powerful dyeing properties. A small proportion of it is soluble in water, but the principal bulk dissolves only in alcohol or alkalies. It is quite insoluble in acids.

Longmore employed strong alkalies to salt out the soap in the foots and to keep the gossypol in solution. He isolated the gossypol by adding acid to the alkaline solution. He mentions no further purification and it is evident that his product was very impure.

Finally Marchlewski[6] isolated a crystalline product from the "foots" of cottonseed oil by means of a tedious purification process. He named the crystalline substance gossypol from gossyp(iumphen)ol. His method of preparation is given in the following translation:

> The crude product which was obtained from an English oil manufacturer had already undergone a purification process consisting of the removal of the greater part of accompanying fatty acids in the form of their calcium salts.
>
> It was extracted with ether which dissolved the gossypol, its oxidation products (which give the solution a dark brown, almost black color) and also considerable amounts of impurities. This solution is concentrated. There remains a viscous mass which is added in portions to boiling acetic acid. When solution takes place it is filtered from a small residue and allowed to cool. After some standing a dark brown amorphous mass separates which is again dissolved in acetic acid. After 4 or 5 repetitions one finally obtains microscopic crystals which are dark brown in color, and which represent the still very impure gossypol.
>
> Further purification is best secured as follows: Dissolve the crystalline mass in boiling alcohol and add to the dark brown solution 50 per cent. acetic acid until clouding is noticeable. Then the solution is heated to boiling and filtered. After some standing crystals appear which are considerably lighter than the first product. Repeating this process 5 or 6 times finally yields a beautifully crystallized yellow product. Attempts to obtain the gossypol entirely colorless failed. It seems then that the yellow color is inherent athough this is not considered as established.

Marchlewski's "gossypol" was, no doubt, a substance containing one molecule of acetic acid in loose combination with the phenolic body. This compound with acetic acid will be called for convenience gossypol "acetate," and the phenolic body itself *gossypol.*

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[6] *J. prakt. Chem.*, 60, 84–90 (1899).

In a personal communication to the writer, A. G. Perkin states that he had a very large quantity of it in paste form and that Professors Hummel and Knecht carried on experiments in the hope of converting it into a dye of commercial importance but without success. Perkin intended to work with gossypol but refrained when Marchlewski stated that he wished to reserve the subject.

Occurrence.—Gossypol appears to be a constituent of the cotton plant only. It occurs in peculiar glands called "gland dots," "secretion cavities," or "resin glands," which are present in all parts of the plant except the woody tissue. These are 100 to 400 μ in diameter and are readily visible to the eye. They appear to be of lysigenous origin, *i. e.,* formed by disintegration of adjacent cells.[7] The author obtained a crude material from an ether extract of the bark which evidently was chiefly gossypol. It was not obtained crystalline. The glands in the root-bark, leaf, petals and boll as well as those of the seed give with concentrated sulphuric acid a characteristic red color, from which fact it is inferred that gossypol exists in all these. An excellent description of the cross section of the seed, showing situation of the glands, is given in Winton's "Microscopy of Technical Products," p. 365.

A. G. Perkin[8] states that gossypol "is not identical with and does not appear to be allied with the coloring matter of the (cotton) flowers."

Amount Present in Cottonseed.—Analyses of parts of the plant other than the seed have not been made. By two different methods, the amounts of gossypol present in the undried kernels, nearly free from lint and hulls, has been found to be about 0.6 per cent. The highest yield recorded was 0.63 per cent.

Attempts have not been made to study the actual variation in different varieties of the cotton plant, but since all varieties of seed seem to have approximately the same number of glands, it would appear that the gossypol content does not vary to a greater extent than the oil or protein content. Assuming for convenience that 100 Gm. of fresh raw kernels contain 0.6 per cent. gossypol and 33.3 per cent. oil, then the ether extract of this material would contain about three times 0.6 or 1.8 per cent. gossypol. Since extraction

[7] A photomicroscopic study of the formation of these glands has been made by Dr. A. Viehoever and Mr. E. E. Stanford of the Pharmacognosy Laboratory of the Bureau of Chemistry. It is not yet published.

[8] *J. Chem. Soc.,* 75, 825 (1899).

by petroleum ether does not remove gossypol, the residue after extraction by petroleum ether or gasoline would contain about 0 9 per cent. gossypol.

Preparation.—The methods which have been used to isolate gossypol from cottonseed are much simpler than the tedious process by which Marchlewski secured it from the "foots" of cottonseed-oil purification. A crystalline product of high purity is secured directly.

Method 1.—It has been found most convenient to use decorticated cottonseed kernels or "meats" which have been passed through rollers to crush the kernels before they are cooked in the oil mill. The kernels are flattened out and in this condition are easily broken up by sifting into smaller particles. The material is passed through a coarse sieve to remove the greater part of the lint and hulls, and then is extracted with petroleum ether or gasoline. For preparation of considerable amounts of gossypol the kernels may be simply percolated with gasoline to remove the greater part of the oil. The resulting material is dried and extracted with ethyl ether. The extract amounts to 2 to 6 per cent. of the weight of material extracted according to the thoroughness of previous extraction. The concentrated extract is of a dark cherry-red color if fresh kernels have been used or almost black if from older seeds. These "gossypol extracts" contain about 17 per cent. to 50 per cent. gossypol. In one case where very fresh kernels were used a considerable part of the gossypol separated out of the "gossypol extract" on standing as a red crystalline powder. The gossypol may be precipitated in brown amorphous flocks by adding petroleum ether, but better yields, practically quantitative, are secured by treating the gossypol extract with one half to one third its volume of glacial acetic acid. On standing several hours or days, or more quickly by warming in the water bath, most of the gossypol separates as the well-crystallized gossypol "acetate" containing 10.1 per cent. acetic acid of composition. The crystalline paste is then sucked off and washed with small amounts of glacial acetic acid, and then with petroleum ether. For further purification the gossypol acetate thus secured is dissolved in ether and glacial acetic acid—about 10 parts to 1 part of gossypol—is added. The ether is then in part distilled until the gossypol begins to separate readily. By this method the fatty and colored impurities are retained by the solvent, which is not so much the case when Marchlewski's method using alcohol and aqueous acetic acid is followed. The crystalline product in this case contains uniformly 10.1 per cent. acetic acid, while by Marchlewski's method it tended to vary from 8.5 to 9.6 per cent.

For the preparation of crystalline gossypol from the "acetate" the latter is dissolved in ether and water is added. The ether is distilled, leaving the gossypol as crusts floating on the water which contains all the acetic acid. The free gossypol may then be crystallized from alcohol or other suitable solvent.

Method 1a.—In this method the kernels are not previously extracted with petroleum ether, but with ethyl ether only. The evaporated ether extract is treated with acetic acid and allowed to stand until the gossypol "acetate" separates out. This requires a much longer time than in Method 1. The use of 80 per cent. and 90 per cent. acetic acid is more advantageous than the use of the glacial acid. It was found that 7 parts of 80 per cent. acetic acid per 100 of extract gave larger yields than did 90 per cent. or 100 per cent. acetic acid. Acid weaker than 80 per cent. tends to form a separate layer with the extract. By adding 7 parts per 100, heating to 100° to 115° and then setting aside, the separation of the gossypol "acetate" is hastened. Nevertheless, this is very slowly formed, requiring one to three weeks. The yields are poorer on account of the large mass of oil present but from 50 to 80 per cent. of the gossypol may be obtained if sufficient time is given.

Method 2.—The basis of this method is the insolubility in oil of the salts of gossypol. This principle is applied commercially in removing the gossypol and other coloring matters from crude cottonseed oil. The extracts (cf. Method 1) of cottonseed kernels are shaken with a slight excess of strong aqueous caustic soda. The sodium salt of gossypol and sodium salts of the free fatty acids are formed and pass into the aqueous layer, while the clear yellow oil rises to the top. The alkaline liquor is neutralized with acid which causes the fatty acids and gossypol to separate as a pasty mass. This mass may be treated with hot acetic acid to cause separation of the gossypol. This method is not satisfactory and is almost useless where much free fatty acid is present in the oil, when a "break" into oily and aqueous layers is greatly retarded. Gossypol quickly oxidizes in alkaline solutions exposed to air. This oxidation, however, may be retarded by adding sodium hyposulphite ("hydrosulphite") $Na_2S_2O_4$.

If little free fatty acid is present in the gossypol extract, the amount of gossypol present may be approximated by the use of standard dilute alkali. Ether and other fat solvents are added, if necessary, to destroy emulsions. Phenolphthalein is used as indicator. The color change occurs in the aqueous layer after the formation of the disodium salt of gossypol.

Method 3.—This method involves the use of aniline as a precipitating agent for gossypol. A very slightly soluble compound,[9] apparently the dianiline salt of gossypol, is formed, which separates out of an oily extract on standing as an orange-yellow microcrystalline precipitate. Aniline (about 5 per cent. of the weight of the extract) is added to an ether extract of cottonseed. The mixture is warmed on the water bath and set aside to stand a week or more. If given sufficient time the yield is practically quantitative and the method has been used to estimate[10] the amount of gossypol in extracts of cottonseed products.

The aniline-gossypol compound is filtered out and washed free from oil, etc., with ether, or with a small amount of ether followed by larger amounts of petroleum ether. It may be purified by recrystallization from aniline.

To prepare gossypol from the aniline compound it is dissolved in hot alcoholic potash to decompose it and the aniline is steam-distilled out. The resultant aqueous solution of potassium "gossypolate" is treated with a pinch of sodium hyposulphite ($Na_2S_2O_4$) in order to reduce any of the blue oxidation product which may be formed. The gossypol is then precipitated in amorphous flocks by acidifying. It may be filtered out or removed from the solution by shaking with ether in a separatory funnel. It may be purified according to Method 1.

Molecular Weight of Gossypol.—It was first sought to determine the molecular weight of gossypol by physical methods. Preparations of gossypol recrystallized from alcohol with the addition of 50 per cent. acetic acid were first used. The results with various solvents were not uniform. Thus, while the boiling-point method with ether and acetone indicated a molecular weight of 300 to 350; with alcohol, benzene and carbon tetrachloride, the elevation of the boiling point was abnormally small, indicating a much greater molecular weight. The freezing-point method with benzene was unreliable, owing to the slight solubility of the substance in cold benzene. These results led to suspecting the presence of solvent of crystallization. This was found to be the case as previously described. Further molecular-weight determinations with the McCoy apparatus of the gossypol freed from acetic acid gave the following results:

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[9] This compound was discovered by Dr. J. T. Dobbins working in this laboratory in attempts to prepare "B" gossypol.

[10] This method therefore may be used to approximate the relative toxicity of extracts. (See *J. Biol. Chem.*, 32, 87 (1917).)

(1) Ether as solvent. Gossypol 1.002 G. Ether 17.73 G. Elevation 0.20°. Molecular weight found: 595.

(2) Acetone as solvent. Gossypol 1.008 G. Acetone 25.6 G. Elevation 0.121°. Molecular weight found: 553.

(3) Gossypol "acetate" in ether as solvent. Gossypol "acetate" 0.994 G. Ether 20.0 G. Elevation 0.291. Apparent molecular weight found: 352.

These data indicate that the gossypol "acetate" dissociates in solution into free gossypol and acetic acid, causing the previously mentioned anomalous results.

After it was found that gossypol "acetate" crystallized from ether-acetic acid contained uniformly about 10.1 per cent. acetic acid or somewhat more than that prepared in Marchlewski's way, the latter's method was abandoned. Since the determination of acetic acid is easily and accurately made, the method offers a reliable method for the determination of the molecular weight.

Gossypol "acetate" recrystallized 4 times from ether-glacial acetic acid mixture was dissolved in ether. Warm water was then added and the ether driven off. The water was then separated from the brittle crusts of gossypol which remained, the latter dissolved in ether, and the previous treatment repeated. The water containing the acetic acid was then titrated with alkali using phenoltetrachlorophthalein as indicator.

Subst., (I) 0.5326, (II) 0.5057; Cc. 0.1 *N* NaOH, (I), 8.98, (II) 8.57.
Acetic acid found: (I) 10.12, (II) 10.17.
Acetic acid calc. for:
(1) Mol. wt. 592 $C_{30}H_{28}O_9 \cdot C_2H_4O_2$ 10.18
(2) Mol. wt. 594 $C_{30}H_{30}O_9 \cdot C_2H_4O_2$ 10.10

Hence "free" gossypol has a molecular weight of 530 if $C_{30}H_{28}O_9$, or 532 if $C_{30}H_{30}O_9$.

The above values for the molecular weight of gossypol stand in agreement with the values obtained by direct titration of the residual gossypol after removing the acetic acid of combination. The free gossypol left after removal of the acetic acid in the above determinations was dissolved in alcohol and titrated with alkali, using phenoltetrachlorophthalein as indicator. Since the gossypol solution is yellow the end point is more difficult to detect.

The weights of gossypol used here were found by subtracting the 10.12 per cent. and 10.17 per cent. acetic acid from the weights of the gossypol "acetate" used above.

Subst., (I) 0.4787, (II) 0.4543; Cc. 0.1 *N* NaOH, (I) 17.6, (II) 17.0.

Hence assuming gossypol neutralizes two equivalents of NaOH the values for the molecular weight are (I) 544, (II) 532.

Concordant results were also obtained by titrating weighed amounts of pure gossypol and of gossypol "acetate." The "acetate," as is evident, neutralizes three equivalents of alkali. While gossypol thus behaves as a fairly strong acid, it is not thought that it contains carboxyl groups since the benzoyl and acetyl derivatives are not soluble in cold dilute aqueous alkali. The fact that the disodium salt of gossypol is neutral to phenolphthalein in aqueous solution gives an indication of its relative strength as an organic acid.

Empirical Formula.—The following analytical data give results which agree well with the formulas $C_{30}H_{28}O_9$ or $C_{30}H_{30}O_9$ for gossypol.

ANALYSIS OF GOSSYPOL "ACETATE" FOUR TIMES RECRYSTALLIZED FROM ETHER AND GLACIAL ACETIC ACID.

	Subst.	CO_2.	H_2O.	%C.	%H.
		1st Crop of Crystals.			
1	0.2321	0.5547	0.1197	65.16	5.77
2	0.2263	0.5404	0.1197	65.12	5.92
		2d Crop of Crystals.			
3	0.2107	0.5013	0.1089	64.89	5.79
4	0.2161	0.5142	0.1072	64 89	5.55
5	0.2182	0.5205	0.1153	65.04	5.91
Calc. for $C_{30}H_{28}O_9.C_2H_4O_2$:				64.84	5.45
Calc. for $C_{30}H_{30}O_9.C_2H_4O_2$:				64.62	5.77

ANALYSES OF OTHER PURE PREPARATIONS OF GOSSYPOL "ACETATE."

	Subst.	CO_2.	H_2O.	%C.	%H.
1	0.1943	0.4628	0.0963	64 94	5.55
2	0.2207	0.5257	0.1080	64 97	5.48
3	0.2022	0.4819	0.0989	64.98	5.47

PURE "FREE" GOSSYPOL, PREPARED FROM THE GOSSYPOL "ACETATE" (RECRYSTALLIZED 4 TIMES) BY REMOVAL OF ACETIC ACID AND CRYSTALLIZATION FROM DILUTED ALCOHOL.

1	0.2246	0.5573	0.1097	67.67	5.47
2	0.2381	0.5929	0.1165	67.90	5.48
3	0.2361	0.5861	0.1167	67.70	5.53

FREE GOSSYPOL, EARLIER PREPARATIONS, POSSIBLY LESS PURE.

1	0.1953	0.4878	0.0969	68.11	5.55
2	0.2079	0.5183	0.1032	67.98	5.55
Calc. for $C_{30}H_{28}O_9$:				67.64	5.30
Calc. for $C_{30}H_{30}O_9$:				67.39	5.66

Salts of Gossypol.—Gossypol readily forms salts with alkalies. It dissolves easily in aqueous sodium hydroxide, carbonate and very slowly in bicarbonate and disodium phosphate. Gossypol may be titrated as a dibasic acid with dilute alkali, using phenolphthalein as an indicator. The alkali salts are very soluble in water and alcohol and are extremely sensitive to oxidizing agents. The yellow color of their solution soon turns greenish brown and then slowly to a beautiful blue which in turn gradually disappears. The alkali salts may be precipitated by saturated salt solution and a similar salting out action of the alkali is noted when attempts are made to break up gossypol with fused alkali.

Lime water and baryta water do not dissolve gossypol as readily as do alkali hydroxides, which seems to be due to the lesser solubility of these salts. Neutral salts of the alkaline earths do not precipitate gossypol from its alcoholic solutions, neither do silver mercury or copper salts. Iron sulphate and lead acetate give amorphous brownish and yellow lake-like precipitates, respectively, from alcoholic solutions of gossypol. Gossypol does not readily dissolve in strong or dilute ammonia water. The ammonium salt is probably formed but as an insoluble compound. After warming gossypol with dilute ammonia and cooling, the liquid formed a gelatinous mass, evidently due to the physical properties of the ammonium salt.

Compound of Gossypol with Aniline.—Gossypol dissolves readily in warm aniline with which it combines to form a bright orange-yellow substance,[11] which is possibly the dianiline salt of gossypol which separates out almost quantitatively on cooling the solvent. It is possible that instead of being a simple aniline salt of gossypol it may be a condensation product of carbonyl groups in gossypol with the amino group of aniline. The substance dissolves in alcoholic potash with a blood-red color which seems to persist for a period longer than one would expect if the alkali immediately replaced the aniline at the acid groups. Both "B" gossypol and "D" gossypol, described later, give similar orange-yellow precipitates.

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[11] This substance heated to 100° was found to contain 3.97 per cent. nitrogen, which agreed sufficiently well with the 3.90 per cent. required for a substance of the formula $C_{30}H_{28}O_9 \cdot 2C_6H_5NH_2$. This seemed at the time to be

The insolubility of the aniline compound of gossypol furnishes a method of determining the amount of gossypol in cottonseed products, and therefore a chemical method for determining the relative toxicity of a cottonseed product. These compounds do not dissolve readily in the usual organic solvents but are least soluble in petroleum solvents. Warm aniline dissolves them readily and they separate out in crystalline form on cooling. Alcoholic potash dissolves them with a beautiful red color which, however, disappears after the compound is decomposed by the reagent into gossypol and aniline.

The aniline compound of gossypol was first made by Dr. J. T. Dobbins in this laboratory. It was desired to see if "B" gossypol, which at that time was thought to be the product in cottonseed meal formed from gossypol in the cooking process, could be made without the formation of the black material which accompanies it when gossypol is heated to 180–190°. It was thought by Dr. Dobbins that by heating the gossypol in aniline this could be avoided. It was found, however, that even in boiling aniline the gossypol was not decomposed as in dry heating. On cooling the solvent it was noticed that an orange-yellow crystalline substance was deposited. This interesting compound is not appreciably toxic, probably on

the most plausible explanation of the reaction since gossypol behaves as a fairly strong dibasic acid. Later this analysis was checked by another chemist, who reported 4.35 and 4.38 per cent. nitrogen on the unheated material. This appeared to indicate that aniline was disengaged on heating. I have more recently made analyses of this same preparation and have found 4.61, 4.64, 4.84, 4.70 per cent. nitrogen in the unheated substance. There is no perceptible odor of aniline to this substance. The average of 4.65 per cent. for the three most closely agreeing results agrees better for a compound containing 2 molecules of gossypol to 5 molecules of aniline, $2C_{30}H_{28}O_9 \cdot 5C_6H_5NH_2$, which requires 4.58 per cent. nitrogen. My analyses of the aniline compounds "B" gossypol and "D" gossypol show, respectively, 4.84 per cent. and 4.15 per cent. nitrogen.

account of its extreme insolubility. It passes through the digestive tract unchanged.

Presence of Gossypol as such in Commercial Cottonseed Products.—Examination of a number of cottonseed products with a view to determining the fate of gossypol has given results which are of considerable interest. Very little, if any, gossypol was found in samples of hot pressed meal. In one case a small amount was found where the seed used was very dry. On the other hand in the so-called "cold pressing" process at least three fourths of the gossypol of the seed passed into the oil. Such an oil was found to contain 1.5 per cent. gossypol. On treatment with alkali any gossypol in the crude oil is quantitatively removed and passes into the foots. Since crude oil is always treated with alkali no gossypol or related pigment is ever found in the refined edible oil. Since the non-occurrence of gossypol in hot pressed oil is contrary to what might be expected and since it does not occur in *actually cold pressed* oil it may be well to explain the difference. Actual cold pressure squeezes out the oil from the oil cells without allowing it to dissolve gossypol from the "resin glands." Hence the gossypol remains in the press cake. In the commercial "cold pressing" process the seed is heated to a considerable extent and the material is subjected to a grinding, pulverizing action under great pressure so that the glands are broken up and the contents taken up by the hot oil and removed mostly from the cake.

In the hot pressing process as ordinarily conducted under the moist cooking conditions the gossypol glands are disintegrated by the moisture and stirring and the contents stream out and are spread over the seed tissue, where the gossypol is subjected to oxidizing influences. It is not clear why so little passes into the oil, but perhaps the seed tissue holds the gossypol and its oxidation product—"D" gossypol—much as cloth holds a dye, or possibly some chemical combination may take place.

If rather dry seed is used the gossypol is apparently not so readily converted to this less soluble, less toxic oxidation product but remains in part as such in the meal. Such a meal is more toxic than a properly cooked meal. In these cases gossypol may be extracted with ether and the amount estimated by the aniline method. It is interesting to note that gossypol in crude oil behaves much the same as free fatty acid. This was shown by dissolving some gossypol in neutral cotton oil, after which alkali was required to render the oil again neutral to phenolphthalein.

Thus the presence of a considerable amount of gossypol in crude oil would increase the refining loss. The writer has been informed that commercial "cold-pressed" oil tends to show a smaller refining loss than hot-pressed oil. Provided the same seed were used in each process, the author believes that the reverse would be true, owing to the presence of considerable amounts of gossypol in the crude cold-pressed oil.

West Raleigh, N. C.

HOMATROPINE AND THE VITALI TEST.[1]

By H. Droop Richmond.

In both the British and the United States Pharmacopœios the Vitali test is given as the means of distinguishing homatropine from atropine, hyoscyamine, or hyoscine. Although the hydrobromide is the only official salt, this test might be presumed to be applicable to other salts of homatropine. In the case of the sulphate, however, a distinct violet color is obtained when 0.01 grm. of homatropine sulphate is evaporated with 5 drops of nitric acid to dryness in a porcelain dish on a water-bath, and a few drops of alcoholic potassium hydroxide are added to the residue.

It was found that when prepared with pure homatropine which did not give a Vitali test, the sulphate yielded a violet coloration, and that addition of the equivalent amount of sulphuric acid to homatropine hybrobromide, or hydrochloride brought out a violet coloration. It would appear, therefore, that the sulphuric acid of the sulphate so intensifies the action of the nitric acid as to produce a result which is not given in the absence of sulphuric acid. It was found that when the alkaloid is separated from the homatropine sulphate and the Vitali test carried out on this instead of on the original salt no violet coloration is obtained, and it appears, therefore, to be necessary to use this modification of the Vitali test as a means of distinguishing between atropine, hyoscyamine, or hyoscine and homatropine, when the sulphate is tested, and the direct result should not be accepted as positive until the test has been repeated on the extracted alkaloid.

[1] From the *Analyst* for May, 1918.

THE MELTING-POINT OF ATROPINE SULPHATE.[1]

By H. Droop Richmond.

In the British Pharmacopœia the melting-point of atropine sulphate is given as from 189° to 190° C.; in the United States Pharmacopœia it is stated that it usually melts between 188° and 191° C., but when anhydrous and free from hyoscyamine it melts between 181° and 183° C. These statements are not in accordance with the fact. The melting-point of atropine sulphate is accurately given by Carr in Allen's "Commercial Organic Analysis," Vol. VI, p. 196, where it is stated that, when dried at 100° C., it melts at 194° C., but the presence of moisture considerably lowers this point.

As a matter of fact, the melting-point has been observed on many occasions to be even slightly above 194° C.

In determining the melting-point of atropine sulphate, it is important that the temperature of the bath shall not be too close to the melting-point as atropine sulphate takes up a small quantity of water very easily, and if immersed in a bath only a few degrees below the melting-point this water is driven off rapidly, but before being so it causes the salt to sinter together and acquire an appearance which may be mistaken for melting, and this will take place within a very few degrees of the temperature of the bath. Shortly after this the salt loses its water, becomes anhydrous, and does not actually melt until the proper temperature has been reached; a false melting-point many degrees low may be easily recorded. If, however, the temperature of the bath is, say, 25° or 30° C. below the melting-point, the water is not driven off so rapidly, and the sintering-point is passed without any marked change, or anything which could be mistaken for the change which takes place at a true melting-point. The statement in the United States Pharmacopœia that when anhydrous and free from hyoscyamine it melts between 181° and 183° C. appears to be untrue, and is probably based on an old statement in a former British Pharmacopœia.

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[1] From the *Analyst* for May, 1918.

NON-ALCOHOLIC PURE FLAVORS.[1]

By R. O. Brooks, B.Sc.,

consulting food and drug chemist, new york city (formerly state chemist, new jersey and pennsylvania).

About ten years ago, as your first "official chemist," I had the pleasure of reading a paper before one of your first conventions, held in this city.

At that time I appeared as an amateur prophet and after describing the then recent genesis of the "Circular No. 19" flavoring standards, I predicted that they had come to stay for quite a while, that State food inspection laws and officials would adopt them in toto and that the Federal authorities would generally follow them when inspecting extracts and flavors.

Since then, by yearly articles in your official organ I have tried to keep the trade posted as to the new developments in the legal chemistry of flavorings. Now I am making a second appearance before you and while not claiming to be even an amateur prophet, yet I feel that it may be worth while to look ahead a little, again. As prophets are always unrecognized in their own country, or at least seldom taken seriously, I am confident that nothing that I say will cause you any worry.

Now as to some war conditions affecting your business and more particularly some unfair and unwise advantages that are being taken of war conditions, possibly at the expense, partly, of Teutonic paymasters. As you know, the cost of pure alcohol in any form has always been absurdly high and at the same time, just now, prohibition is one of the orders of the day.

I do not want to predict that the sale of alcoholic flavorings will be interdicted in all or even many of our states, yet such a thing is possible and with the continued outcry against the conversion of foodstuffs into alcohol it is possible that sooner or later only the alcohol from wood-sugar fermentation will be available.

If prohibition has come to stay, it is now the psychological moment to take advantage of its crusade among the women and to introduce and push the sale of non-alcoholic flavorings. The government would have to revise their general definition of an extract, as the solution of flavoring substances in alcohol, or at least no longer consider "flavor" as synonymous with "extract," or else provide standards for a set of non-alcoholic flavors.

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[1] Read at Ninth Annual Convention of Flavoring Extract Manufacturers' Association of the United States. Reprinted from the Simmons's *Spice Mill*, July, 1918.

In fact, several government departments have already specified non-alcoholic flavors in their supply contracts; thus the navy use a mixture of dry ground vanilla beans and dry sugar and the Indian reservations call for a solution of lemon oil or orange oil in a fatty oil, such as cottonseed oil or corn oil. Evidently the Indian squaw does not object to a turbid gelatine dessert or a little extra shortening in her cakes.

As to glycerin, it has been used vaguely in an occasional vanilla extract and to a considerable and steadily increasing extent it has been churned up thick with gums and essential oils and oleoresins to form the well-known "tube flavors." However, I understand, from those who are more closely in touch with governmental plans than I am, that the warlike requirements for glycerin will soon result in vigorous restrictions on its use in flavors and pharmaceuticals. Moreover, the present price of glycerin cannot be called moderate; in fact, it costs more than alcohol, while not having the preserving value of the latter.

When citrus extracts were made by actually extracting the oil from the peels, alcohol seemed the natural extracting agent, but nowadays all the essential oils are obtained in another industry and about the only extracting done by the present-day "flavoring extract" maker is the preparation of vanilla extract; and even here we find that many are merely buying and diluting a concentrated extract or oleoresin, made more scientifically and economically by some supply house.

Now I will agree that alcohol is perhaps the best extracting agent for vanilla beans and also that it can be nicely recovered by vacuum distillation, yielding a concentrated extract or even an alcohol-free "oleoresin." I cannot agree, however, that, because we extract the flavoring constituents with alcohol, that we must deliver them to the housewife dissolved in alcohol.

Nor is it necessary to deliver the citral, citronellal, geranic esters, etc., of lemon and orange oils in an alcoholic medium and of course every one knows that the terpenes should be kept out of food flavors and restricted to furniture polishes, etc.

In looking over the field for suitable carriers of food flavors, I was attracted by the coincidence that practically every food that is thus flavored is a sweetened product; in fact, old-style vanilla extract is nearly always sweetened with sugar and, for the navy, as said previously, our careful naval chief specifies a mixture of ground vanilla beans and dry sugar. Seventeen years ago, when I was the so-called "state chemist" in New Jersey, I remember testing a mixture of vanillin crystals and sugar, which may still be on the market. Moreover, I think I have read of mixtures of essential oils and dry sugar being sold for food flavoring.

Custom, however, is a queer thing and the housewife's custom of measuring out a spoonful of liquid flavor is deeply rooted, as the manufacturers of the thick emulsified "tube flavors," which are added by squeezing out a drop, have discovered. Must, however, that liquid be mainly alcohol or can we cater to the W. C. T. U. and the prohibition movement, which is mainly feminine, and supply another suitable fluid carrier of flavor?

Why not kill two birds with one stone and supply both flavor and more or less of the sugar sweetening in liquid form at the same time? Which suggestion brings us a consideration of sugar as carriers of flavor. The difference between this proposition and the soda syrups is that the first refers to a strong flavoring product while the soda syrups are merely a mildly flavored product for direct consumption.

Unfortunately, most of the sugar syrups have a decided flavor of their own (such as maple or cane syrups) or else crystallize out if strong enough to not ferment or ferment if thin enough to not crystallize. In recent years, however, there have appeared on the market at reasonable prices several scientifically prepared flavorless sugar solutions, composed of varying proportions of dextrose, levulose and sucrose (all well-known food sugars) and having varying properties, as concerns crystallizing, sweetening power and viscosity.

Two of them are particularly free from interfering flavor and one of these two I have found to be so carefully regulated in its manufacture and so constant in its composition, viscosity and entire freedom from crystallization that I have used it exclusively in the experimental work I will soon describe and show you samples of. It is called by the manufacturers "Nulomoline TP" and is advertised by the Nulomoline Co. and by W. J. Bush and Co. in a number of trade journals, especially as a glycerin substitute.

Its specific gravity is 1.409 (about 42° to 43° Be.) and as the total sugar content ranges from 78 to 80 per cent., it can not ferment, at the same time it does not crystallize. It can be safely diluted, 3 volumes with 1 volume of water, or some partially concentrated vanilla extract for instance, and still not ferment, being then of about the consistency of maple syrup and pouring freely. With very concentrated vanilla extracts and "oleoresins," the three to one dilution was used, the concentrated extracts being merely thoroughly mixed in (1 volume concentrated extract to 9 volumes of diluted "Nulomoline") by shaking and the "oleoresin" (4 oz. Av. to one gallon diluted "Nulomoline") by rubbing up with some of the carrier and then mixing by shaking.

Of course it can be used in undiluted form and still pour and by emulsifying with enough gum we get the familiar "tube flavor," as it would replace glycerin in such products very effectively.

The vanilla flavors I have made are no more turbid than the frequently turbid alcoholic extracts and in some of them, where the worthless resins have been filtered from the concentrated extract, I have obtained very clear mixtures, as you see. In those made from "oleoresins" the alcohol content is zero, while in others the alcohol ranges from 3 to 4 per cent., which in a spoonful would be a trace. Thus the very interfering odor and flavor of alcohol (especially some grades) are eliminated and all of us may become judges of the flavor of the beans without waiting for a cooking test.

In the essential oil flavors, the housewife has accepted to considerable extent the very thick, turbid "tube flavors," and if a non-alcoholic flavor is to be the order of the day, she will have to get used to a more or less turbid thin emulsion of Nulomoline and essential oil, or else resort to the fatty oil solutions of essential oils, which would at least make her gelatine desserts very turbid.

The 1 per cent. almond oil flavor will be less turbid than a 5 per cent. lemon or orange oil flavor, of course, but even the turbidity of a spoonful of the latter would be lost completely in the food product flavored with it. However, as said previously, the use of whole lemon and orange oils is slowly becoming obsolete. They become turpentine-like soon after leaving the "copper," gradually get worse even in alcoholic solution and are out of question in "tube flavors" or any emulsified product, which incorporates air and hastens the oxidation of the terpenes. I have prepared emulsions of diluted Nulomoline and 5 per cent. whole lemon oil, with and without the aid of small proportions of gums but I cannot advise the use of whole lemon or orange oil in any emulsified product. Most of my experiments have been made with the true terpeneless lemon and orange oils, approximately 15 times stronger than ordinary lemon or orange oil.

These require the use of less than one half of one per cent. by weight, i. e., one third of a pound of oil to 100 pounds of diluted Nulomoline containing preferably a small proportion of gum arabic or gum tragacanth, although perhaps eggalbumin would do just as well if not better. In adding the small per cent. of powdered gum it is advisable to dissolve it in a fairly large volume of the water used for diluting the Nulomoline, said water having been brought to a boil and the gas turned off and the powdered gum dusted in while stirring.

There are various emulsifying machines on the market, but none of them, I am fairly certain, can surpass the wonderfully efficient machine made by the well-known De Laval Separator Co. and known as the "Emulsor." They also make a very efficient clarifying and filtering machine now used by many up-to-date flavoring extract makers. I owe my thanks to that company, who allowed me the use of their demonstrating laboratory, and to Dr. Alexander, their expert investigator and demonstrator. A speed of 10,000 revolutions per minute is obtained by the "Emulsor," with a capacity (in the 2 hp. belt-driven factory model) approaching 100 gallons per hour.

As said above, I have made these flavors without any gum to aid emulsification and show you a sample which if it shows no separation on long standing, is all that can be desired. It was simply run through the machine twice (which operation requires no watching, by the way) and is really only translucent, not milky. Of course, these citrus oil flavors contain no alcohol at all and we thus get the true flavor, without the interfering effects of strong alcohol.

In the thick "tube flavors," Nulomoline could of course take the place of glycerin, with less tendency to separate, which is one of the weak points in the citrus oil tube flavors as now made.

In closing I would add that I have heard of attempts to emulsify the oils with water only, using some gum, of course, but I should be afraid of the development of molds or a possible fermentation of the gum solution.

THE VITAMINS.[1]

Among the practical points emphasized by Madsen is that lactating woman must have food rich in vitamins. The lack of them may be responsible for certain pregnancy disturbances, uncontrollable vomiting, distaste for food, etc. As rachitis develops predominantly in the artificially fed, the lack of vitamins in the cow's milk or their destruction by boiling the milk, seems a plausible factor in rachitis. We do not know yet whether the scarlet fever virus, for example, survives moderate pasteurization. If the milk has to be sterilized during an epidemic, provision should always be made for supplying vitamins in some other form, meat juice for young infants; potato puree, or egg yolk for older children. In digestive troubles we must beware of not letting the diet get too poor in vitamins, as a diet that makes little demands on the digestive organs is generally poor in vitamins. Desiccation also destroys vitamins in fruit vegetables, etc. This explains why an antidiarrheic diet keeps the patient so languid. The tea, rice water, etc., are peculiarly poor in vitamins, and special measures are necessary to correct this. A surplus of vitamins reduces the calory demand. Tagaki found that the men in the Japanese fleet gained in weight when the rations were modified to include more vitamins although it represented fewer calores. In the Danish prisons, when the bread ration was reduced and barley porridge given instead, the men gained in weight. Barley is richer in vitamins than rye and wheat.

Madsen warns that a lack of appetite is often the first symptom from a deficit in vitamins. He thinks there is much to suggest that a vitamin deficit is a factor in chlorosis anemia, neurasthenia, vasomotor disturbances, etc. In fevers, convalescence, etc., the necessity for an ample vitamin supply is imperative. It is possible that the mysterious benefit from cod-liver oil may be due to an exceptional vitamin content. The commercial infant foods on the market are completely free from vitamins, and they must be added from some other source. In institutions where the food is cooked in large portions at a time, there is liable to be a deficit in vitamins.

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[1] From Ugeskrift for Læger, Copenhagen, April 18, 1918, 80, No. 16, by E. Madsen through *The Journal of the American Medical Association*, June 29, 1918.

There is no doubt, he adds, that beriberi occurs much more commonly in all countries than has been hitherto appreciated, but it is not recognized, as no one looked for it outside the tropics. The war edema without albuminuria may be a rudimentary form of beriberi. It is possible that this may be true also of many cases of peripheral neuritis and heart weakness. Among the peculiarly vitamin-rich foods he lists butter and cheese, egg yolk, raw meat and fresh meat juice and soup. Steamed meat and fish retain their vitamins better than when boiled. Meat extracts are free from vitamins. In grains they occur in a series with rice at the lowest and barley at the highest point; in rice the vitamin occurs only in the hull, in barley in both hull and kernel. The finer the flour is bolted, the less the proportion of vitamin in it. Legumes and potatoes are rich in vitamins, but they pass mostly into the water in which they are boiled, so this water should be used in the preparation of the food. Dried and cooked vegetables have no vitamins. Fresh fruit is rich in vitamins, and in the acid fruits they seem to be especially thermostable. It is still undecided whether wine and oil contain vitamins.

THE A. PH. A. CONVENTION.

This was held in Chicago, August 13 to August 17 inclusive, and the American Conference of Pharmaceutical Faculties convened on Monday, August 12, holding two sessions. The National Association of Boards of Pharmacy also held session on Monday.

The principal business of the Conference grew out of the recommendation of President Henry Kraemer that means be devised for the classification of drug stores as either professional pharmacies, or commercial drug stores; and that a corresponding classification of the colleges be made. A committee was appointed to study the problem.

The Executive Committee of the Conference reported that the Carnegie Foundation had promised to give early consideration to the request for the investigation of pharmacy schools. The report of this committee showed also that of the students in pharmacy in the conference schools, 58 per cent. were high school graduates; but these statistics did not include the New York schools which reported the State Pharmacy Certificate for their students, and not amount of secondary education in high school years.

The Fairchild Scholarship Examination Committee reported that the action taken last year at the Indianapolis meeting had converted the Scholarship into a Research Fellowship, and that provision had been made, in conformity with last year's action, to grant the Fairchild Scholarship (or Fellowship) on the following basis:

1. That it be limited to graduates from a pharmacy course desiring to return to college for post-graduate instruction.

2. That it be granted to the candidate best equipped for research work.

3. That this ability be determined on evidence of research work previously performed by the candidate and embodied in a thesis, in a paper published in a pharmaceutical or other scientific journal, or in an unpublished paper, but in the latter case, the certificate of the dean of the college, to the effect that the paper records work performed by the candidate, must be provided.

4. That the documentary evidence with reference to research work performed by the candidate be graded on the basis of 50 credit units; that the candidate's pharmaceutical scholastic record be rated on the basis of 40 credit units, and his non-pharmaceutical scholastic record (above high school grade), at 10 credit units.

The opening session of the American Pharmaceutical Association was held Tuesday evening, April 13, and was well attended. Prof. J. U. Lloyd pronounced a most eloquent invocation, after which President A. R. L. Dohme read his address, an able and interesting one, dealing in the main with the subject of the proposed federation of the various pharmaceutical organizations.

The National Association of Boards of Pharmacy held several interesting sessions, and one joint session with the Conference of Pharmaceutical Faculties. The resolution of special interest was to the effect that steps be taken to determine upon a minimum standard for colleges and for pharmacy courses with the view to recognition of colleges by the National Association of Boards of Pharmacy.

The Executive Committee of the National Drug Trade Conference held a meeting on August 13 and decided to call upon the proper authorities in Washington, and to urge the creation of a pharmaceutical corps in the Army.

A committee consisting of Dr. A. R. L. Dohme, Mr. Samuel C. Henry, and Mr. Charles M. Woodruff, was appointed to make arrangements for such a meeting, and to gather facts and formulate arguments.

The entertainment included a luncheon, on the Chicago Municipal Pier, given by the Chicago Retail Druggists' Association, and a luncheon in the Congress Hotel, given by the Chicago Veteran Druggists' Association. On both occasions, there were speeches and geniality and good fellowship.

On Wednesday, August 14, the alumni of the various colleges took luncheon together. The following colleges were represented—Philadelphia College of Pharmacy, University of Illinois, Nor hwestern, New York College of Pharmacy, Massachusetts College of Pharmacy, Maryland College of Pharmacy, and Cleveland College of Pharmacy. Over 100 alumni were present.

The committee on nominations of the American Pharmaceutical Association presented the following names:

For president, L. E. Sayre, L. A. Seltzer, E. N. Gathercoal; for first vice-president, T. J. Bradley, A. H. Clark, W. H. Rudder; for second vice-president, Harry Whitehouse, John Culley, Miss Zada M. Cooper; for third vice-president, Jacob Diner, E. Fullerton Cook, Adolph Umenhofer.

J. W. S.

SUMMARY OF THE PROCEEDINGS OF THE 1918 MEETING OF THE AMERICAN CONFERENCE OF PHARMACEUTICAL FACULTIES AT CHICAGO, ILLINOIS, AUGUST 12–13, 1918.

By Theodore J. Bradley, *Secretary*.

The nineteenth annual meeting of the American Conference of Pharmaceutical Faculties convened at the Congress Hotel, Chicago, on Monday, August 12, 1918, with representatives of twenty-six schools in attendance. Three sessions were held, and, in addition, a joint session with the National Association of Boards of Pharmacy.

Henry Kraemer of the University of Michigan was president of the Conference for 1917–1918 and presided at all sessions of the meeting. In his presidential address he discussed several topics of interest and importance to pharmacy and colleges of pharmacy, the most prominent of which was a strong plea for two distinct classes of drug stores, the commercial and the professional, with corresponding courses in colleges of pharmacy, one preparing for the practice of commercial pharmacy and the other for the practice of professional pharmacy. F. J. Wulling, of Minnesota, read a paper supporting the plea of President Kraemer for two kinds of pharmacies.

After consideration of recommendations made by President Kraemer, the conference adopted the following resolutions:

1. That a special committee of three be appointed by the incoming president to consider and report on the question of the establishment of two distinct classes of pharmacies, namely, the commercial drug store and the professional pharmacy, this committee to work with a corresponding committee of the National Association of Boards of Pharmacy, if such a committee is appointed by that organization.

2. That a committee be appointed by the incoming president to work out methods of presenting the advantages of pharmacy as a calling to high-school students of the country.

3. To continue the agitation for the standardization of degrees granted by colleges of pharmacy.

The report of Secretary-Treasurer T. J. Bradley showed that the conference now has forty-six member schools, and that the finances of the organization are in a prosperous condition, there being a balance of slightly more than a thousand dollars in the treasury, with all bills paid. On recommendation of the secretary-treasurer it was voted to request that the proceedings of the joint session of the conference and the Association of Boards of Pharmacy be published in the *Journal of the American Pharmaceutical Association.*

Chairman J. A. Koch made a report for the Executive Committee, in which it was shown that 58 per cent. of the new students matriculated in 1917 in the colleges of pharmacy of the country were graduates of high schools, or had an equal or better preliminary education, and that the other 42 per cent. of the new matriculants had completed one to three years of high school work. It was also reported that the Carnegie Foundation has promised to give early attention to the question of the investigation and classification of pharmacy schools in a manner similar to the investigation made of medical schools a few years ago.

The report of the executive committee also dealt with the question of military instruction for students in colleges of pharmacy and this subject was discussed at length. It appears likely that students will be allowed to enlist in a reserve army for military instruction, and it is to be the policy of the government that they be not called for service, except in great emergency, until their college courses are completed, provided that their college work is of satisfactory quality.

The report of the Pharmaceutical Syllabus Committee was presented by W. C. Anderson of New York. This committee reported that the preparation of the third edition of the *Syllabus* is well under way, and the Conference voted to continue its annual contribution of twenty-five dollars towards the expenses of this committee.

Memoirs of the services to pharmaceutical education of men who have passed away during the past year were presented as follows: J. P. Remington, by W. B. Day; Charles Caspari, Jr., by E. F. Kelly; A. B. Huested, by William Mansfield; and J. H. Long, by M. A. Miner.

Reports were received from the nine standing committees and from one special committee, which included matter of much value, which will appear in the annual volume of the proceedings of the conference.

The conference voted to instruct its secretary to communicate to the Surgeon General of the United States Army its belief in the erroneousness of a statement widely published and attributed to an officer in the Surgeon General's office, that there are but eight reputable and worthy schools of pharmacy in the United States.

The officers of the conference elected and installed for the ensuing year are: President, Charles B. Jordan, Purdue University School of Pharmacy, Lafayette, Ind.; Vice-President, William Mansfield, Albany College of Pharmacy, Albany, N. Y.; Secretary-Treasurer, Theodore J. Bradley, Massachusetts College of Pharmacy, Boston; Chairman of the Executive Committee, Julius A. Koch, Pittsburgh College of Pharmacy, Pittsburgh, Pa.

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

USE OF TEXTILE FIBERS IN MICROSCOPIC QUALITATIVE CHEMICAL ANALYSIS.

The Detection of Boron by Means of Turmeric Viscose Silk Fibers.—To obtain the characteristic blue color with turmeric by the addition of alkali after drying down with boric acid, certain difficulties are encountered with ordinary turmeric paper, and the most usual result is a greenish-black coloration. The difficulty may be overcome by using individual fibers, instead of paper, and observing the reaction microscopically. For dyeing the fibers, a 50 per cent. alcoholic alkaline solution is made by boiling 20 Gm. of powdered turmeric with 50 Cc. of alcohol, filtering and adding an equal volume of water and 0.5 to 1.0 Cc. of 10 per cent. sodium hydroxide. The fibers are steeped in this solution, which is then evaporated on the water-bath to a syrup. The fibers are then quickly dipped in 95 per cent. alcohol, pressed between filter-paper, dipped in dilute sulphuric acid, washed and dried. Care must be taken to avoid the presence of unabsorbed turmeric, since this interfers with the formation of the blue color. The delicacy and success of the test are largely influenced by the nature of the fiber employed. Viscose silk gives by far the best color reaction, and flax comes next, but is not nearly so satisfactory. For performing the test, a drop of the solution containing boron is placed on a microscope slide, and acidified with dilute hydrochloric acid to decompose borates. A turmeric fiber about 5 Mm. long is placed in the drop, which is allowed to evaporate completely to dryness, either spontaneously or by very gentle warming. The slide is cooled and the fiber examined under the microscope; a rose or violet-rose color indicates boron, and when a drop of 1 per cent. sodium hydroxide solution is placed on the fiber the color changes to Prussian blue, which gradually turns to violet. Too high a temperature in evaporation, failure to carry it to complete dryness, and too strong a solution of soda, interfere with the success of the test. The presence of hygroscopic salts is objectionable, since they prevent the complete drying of the fiber; large amounts of free phosphoric or silicic acid also introduce difficulties; any strong bleaching agent, if present, must first be removed. The test should not be performed on a borosilicate glass slide. The test is only valid for free boric acid; without the addition of mineral acid, borates do not respond. The test is sensitive to 1 drop of a *N*/10,000 solution of boric acid; 1 drop of a solution containing 0.000025 Mgm. of boron gives a positive result.

The Detection of the Heavy Metals by Means of Zinc Sulphide Wool Fibers.—Several natural and artificial fibers were tested as a vehicle for zinc sulphide, but the only fibers which could be caused to absorb sufficient of the reagent for satisfactory use were wool and mohair. The preliminary treatment of the wool fiber is important. The fat is removed by treatment with a mixture of alcohol and ether; the fiber is then swelled by soaking overnight at the room temperature in 1 per cent. sodium hydroxide solution. It is then washed and dipped five or six times alternately in solutions of 10 per cent. zinc acetate and 10 per cent. sodium sulphide the excess liquid being pressed out each time but not washed. After the final dipping the impregnated wool is washed and dried by pressing between filter-papers. The sodium sulphide solution is prepared by passing sulphuretted hydrogen into sodium hydroxide until no precipitate is formed with magnesium chloride. To apply the test, a drop of the solution to be tested is placed on a glass slide and a drop of dilute hydrochloric acid is added. A piece of the treated fiber about 5 Mm. long is introduced and examined under the microscope. The liquid is evaporated to dryness, a drop of dilute ammonia solution is added, and the fiber again examined side by side with a new fiber for detecting slight differences of color by comparison. The color changes are yellow, orange, brown, or black. In acid solution the indications are: Straw-yellow, tin; lemon-yellow, arsenic or cadmium; orange, antimony; reddish-brown, bismuth; brown or yellow-brown, platinum, copper, mercury, antimony (sometimes cobalt, iron, manganese or nickel); black or brown in very dilute solution, silver, lead gold, mercury. With no color in acid solution the fiber may turn brown or yellow-brown in alkaline solution in presence of cobalt, iron, manganese or nickel, but these elements rarely give good reactions. Since the fiber is viewed in transmitted light, a heavy precipitate of yellow or orange color may appear brown or black owing to its density; conversely, a brown or black precipitate in very dilute form may appear brown or yellow. The zinc sulphide wool fibers are sensitive to 0.001 Mgm. of copper. (E. M. Chamot and H. J. Cole, *Journ. Ind. and Eng. Chem.*, through the *Analyst.*)

Fat from Rice Husks.—Prior to the war rice husks, containing proportion of bran, were exported from Italy mainly to Switzerland and Germany, where they were bought on the combined content of proteins and fat and used as a fertilizer. The "titre" of the best samples ranged from 24 to 26 per cent., and that of inferior qualities from 15 to 16 per cent. As a rule the husks yield about 6.5 per cent. of crude oil, which frequently contains a high proportion of free fatty acids owing to enzymic action. A specimen of the fat extracted with petroleum spirit had the following characters: Melting-point, 25° to 26° C.; acid value, 90; saponification value, 186; Hehner value, 95.2; iodine value, 99.7; glycerol, 4.95 per cent. and unsaponifiable matter, 3.2 per cent. The oil obtained by expression (at 300 atmos.), however, was a greenish-yellow oil with the following values: sp. gr., 0.918; acid value, 13.8; saponification value, 179.4; Hehner value, 94.3; glycerol, 9.03 per cent.; and unsaponifiable matter, 0.7 per cent. The acidity of the oil varies with the nature of the rice, the season, and the state of preservation. In order to obtain a less acid oil richer in glycerol, it would be necessary to express the husk immediately after separation or to destroy the enzymes by heat. A sample of the press cake had the following composition: Water, 14.60; nitrogen, 2.73; and fat, 8.6 per cent. (F. Garelli, *Annali Chim. Applic.*, 1917, 8, 109–114 through the *Analyst*, April, 1918.)

CORRESPONDENCE.

OCEAN CABLE SIXTY YEARS OLD.

Four Attempts Required to Get Line in Working Order.

The first Atlantic cable was completed sixty years ago on August 16. From Trinity Bay, Newfoundland, to Valentia, Ireland, the first words shot through the ocean were:

"Europe and America are united by telegraphy. Glory to God in the Highest; on earth peace, good will toward men."

Four attempts had been made to connect the two continents, but on each occasion the cable parted.

It was the high courage of Cyrus W. Field, Peter Cooper, David Dudley Field and others that carried the project through. Even then the full measure of discouragement had not been reached, for after six weeks of experimenting, in which the line was never opened to the public, it broke down.

At the end of two months the operators were dismissed and telegraphic communication between the United States and England was pronounced dead.

The problems to be solved were numerous, but chief among them was the necessity of constructing a cable that would be strong enough to resist the strain placed upon it and at the same time be flexible and slender enough to be carried on a ship. Then an apparatus had to be devised to pay out the cable.

On the fourth trial the Niagara, the largest ship in the United States Navy, and the Agamemnon, an English warship which had been active in the Crimean War, met in the middle of the ocean, July 29, spliced their sections of the cable, and started for home. The Niagara arrived at Trinity Bay, August 4, and the Agamemnon reached Valentia the next day. By August 16 the line was in working order.

The cable was made up of seven copper wires encased in gutta percha, then wrapped in wax hemp, and this covered by an outer sheath of 126 braided wires. It was 2,500 miles long, weighed a ton to the mile, and cost $1,256,250. The total cost of the project was $1,834,500.

To the Editor of American Journal of Pharmacy:

The above clipping from the *Evening Bulletin,* August 16, brings to mind the article by Professor Kraemer in June number of THE AMERICAN JOURNAL OF PHARMACY, "On Medicinal Plants, Present and Future Supplies," in which he alludes to "the story of Marshall Field and the cable as known to every school boy," as an instance of nerve to carry to completion something almost superhuman to the public mind.

In this case the school boy puts one over on the schoolteacher, if the professor refers to the humorous version of that event in rhyme by John G. Saxe as I presume he does, as it was such a familiar one "to speak" in those preelocutionary days. Had he lapsed just a fraction of time he would have recalled the title of the "piece," "How Cyrus Laid the Cable" and given Marshall the credit for the other achievement in Chicago.

To Cyrus W. Field, a capitalist of New York City, must be given the glory of the conception of an Atlantic cable and the successful completion of one after ten years of repeated failures at home and abroad.

He won out by his determination that the few real difficulties could be overcome if they would simply keep at the game of getting after them.

This he did with large capital, the best of electrical science and a great amount of good sense. And the thing went to the bottom of the sea to talk around the world and has been doing so for sixty years.

Did Professor Kraemer try a wire-less joker on the Philosophical Society, I wonder?

Raising medicinal plants is a science from beginning to end; trained men must follow it from selection of seed to selection of soil, to culture, harvesting, storing, to mercantile work, to the testing of physiological, chemical and therapeutic values.

So that one feature miltates in a great measure against individual enterprise, but makes life worth while with a cheerful company of "harvesters."

We have all things needful in this great country as Professor Kraemer relates seeds, space, time and money. Are we then so lacking in national sentiment by not "turning the sod" at home, as to be helping the "Hun with his Hyoscyamus" and other things abroad?

I am too old at present to "take up the gun" but am young enough to "hoe the herb" with the other great big healthy, happy, harvesters. Let's get the habit. JOSEPH CRAWFORD.

THE FAIRCHILD SCHOLARSHIP.

September 2, 1918.

The action taken at the Indianapolis meeting relative to the award of the Fairchild Scholarship for this year is expressed in Recommendation No. 5 of President R. A. Lyman's address, and which reads:

"That it be the sense of the Conference that Mr. Fairchild could render the greatest service to pharmacy by offering the scholarship to a graduate pharmacy student, in order that he might pursue some research problem for one full school year, in the school of his choice; and further, that this scholarship be awarded on the basis of the applicant's scholastic training, his standing as an undegraduate pharmaceutical student and upon his fitness to do research."

The committee to whom the matter of formulating a definite plan for awarding the Fairchild Scholarship was referred consists of H. C. Christensen, chairman, 4149 Vincennes St., Chicago, Ill.; Prof. J. W. Sturmer, 145 N. 10th St., Philadelphia; Dr. George C. Diekman, 115 West 68th St., New York, and Dr. R. A. Lyman, c/o The University of Nebraska, Lincoln, Neb.

The committee has decided that in making the award:

The ability of the candidate to perform research work be given a value of 50 credit units; the pharmaceutical scholastic record a value of 40 credit units; and the non-pharmaceutical scholastic record (above high school grade) a value of 10 credit units.

Further, that the candidate's ability to perform research work be determined upon evidence of research work previously accomplished, and that such evidence may take the form of a thesis presented at a college of pharmacy, or a paper covering research work carried out at a college, but in the latter case it should be accompanied by a certification from the dean that the paper represents the student's individual work. A published paper covering research work performed by the candidate subsequent to his graduation may also be accepted as evidence—at the discretion of the committee.

The committee reports further:

"It is to be clearly understood that this procedure does not necessarily represent the views of the members of this Committee on Examination on the larger problem of the awarding of the scholarship, but is merely a practical plan decided upon the basis laid down at the Indianapolis meeting last year."

Schools or colleges of the American Conference of Pharmaceutical Faculties, therefore having a candidate to present for the Fairchild Scholarship, should at once send his credentials, etc., to Chairman H. C. Christensen, 4149 Vincennes St., Chicago, so as to reach him not later than October 1, in order that the award may be made soon thereafter.

The chairman of the Fairchild Scholarship Committee would also request that the schools and colleges give the matter of the Fairchild Scholarship consideration. As the schools are perhaps most interested it is requested that all schools present their views in writing to Secretary Theodore J. Bradley, of the conference, c/o Massachusetts College of Pharmacy, Boston, Mass., prior to December 1. 1918, with a view to having him lay before the incoming Fairchild Scholarship Committee these expressions, so that this committee can be assured of having all schools interested to the fullest extent when they formulate their plans of award for next year, and with the hope that this will become permanent.

We thank you for giving both these matters your prompt consideration. The first should have immediate attention.

Respectfully,
The Fairchild Scholarship Committee.

THE AMERICAN
JOURNAL OF PHARMACY

OCTOBER, 1918

EDITORIAL.

PHARMACY IN THE MELTING POT.

It may be considered as axiomatic that all progress must be paid for with a price. In the present world war for the extension of human liberty and democracy, the nations of the earth are paying a stupendous price, but who is willing to say that the world's progress that will result from this war will not be commensurate with the enormous sacrifices of blood and resources that are now being made? Out of this titantic struggle there will come a chastened world, and we may well hope with improved moral and social conditions. The effect on the arts, literature, science and industry can be only partially foretold, and its influence upon the professions and commerce is likewise problematical.

The drug trade and the practice of pharmacy will have its share in this ordeal, and we must inevitably look for some changes in the practice of pharmacy. The shortage of labor has reduced the number of drug stores and the higher educational requirements will curtail the number of those taking up the professional side of the calling. We must likewise recognize that there is a growing tendency in pharmaceutical circles for higher attainments along educational and professional lines, and this eventually will have a telling effect upon the practice of pharmacy in America.

Not the least of the conditions that will affect the future of pharmacy will be the changes which will be wrought in the practice of medicine through the demands of the army and navy for physicians, and the changes which the war is going to effect in the practice of medicine and surgery.

It has been stated that the entire world with all its industries may be considered as being in a universal melting pot, and pharmacy is likewise going through its process of refinement and change, and those who have the hope of a professional pharmacy evolving therefrom, have faith that as a result of these various internal upheavals and exterior movements, pharmacy will be more firmly established upon a scientific professional foundation.

G. M. B.

THE OPINION OF AN EMINENT FOREIGN PHARMACEUTICAL AUTHORITY OF AMERICAN PHARMACY.

Dr. J. J. Hofman, Secretary-General of the International Pharmaceutical Federation, has recently published a review of the Pharmacopœia of the United States IX.

It is interesting to note his opinion of the United States Pharmacopœia and his impression of American pharmacy, despite some of the rather derogatory remarks of certain of our presumed leaders in American pharmaceutical circles as to the status of pharmacy in the United States. This eminent foreign pharmaceutical authority, after reviewing the various titles and subjects as treated in the several parts of the Pharmacopœia and some of the important preparations of the United States Pharmacopœia IX, makes the following comment:

"Like every pharmacopœia, the U. S. P. IX contains an historical sketch which shows how pharmacy has developed in the United States. It gives a good impression of American pharmacy, and proves that, next to good salesmanship, which distinguishes the American apothecary, the striving for substantial scientific work, coupled with a practical mind, is also held in high esteem by the pharmaceutical profession there."

G. M. B.

ERRATIC ALCOHOL LEGISLATION.

The United States Congress is commonly looked upon as a body of able legislatures who give careful consideration to the various problems presented to them, and presumably they are acquainted with the past history and precedents that should influence their action. It is difficult, indeed, to conform this estimate of the American Congress with the erratic legislation on distilled spirits which has been decreed in the various Congressional enactments since 1862.

For some unknown reason the drug trade has been singled out for an unjust burden of taxation. In the recent Congressional enactments no other class of business men have been so heavily burdened by taxation, in proportion to the business done, as have the druggists. The War Revenue Measure, approved October 3, 1917, fixed a tax on alcohol withdrawn for non-beverage purposes at $2.20 per proof gallon. The revenue bill now under consideration by Congress proposes to make this tax on distilled alcohol for non-beverage purposes $4.40 per proof gallon. This means that the tax on alcohol used in medicinal preparations will be $8.36 per gallon.

Medicines are rightly classified along with food and clothing as among the prime necessities of life, and it is difficult to understand that any underlying principle or war necessity would dictate a policy of excessive taxation on any of these.

Drugs are collected from all over the world, and the increased war demands for many of these and the existing difficulties of transportation, shortage of labor, and the high cost of the ingredients, including the solvents necessary, have all tended toward making the cost of all medicines abnormally high, and some of those most needed are beyond the means of many of our people.

Alcohol is indispensable in the production of most medicines, and the proposition for still further increasing the cost of medicines by doubling the excise tax on the alcohol used is indefensible as an economic principle. This question is one that must finally be brought home to every consumer, and those afflicted by disease or injury must in the final analysis bear the burden of this tax.

It is doubtful whether any other nation would place such a burden of taxation upon those who must necessarily consume medicines.

A pertinent question to be considered by each member of Congress is whether he is prepared to defend before his constituents such an excessive tax on materials essential to the preservation of life and health—a tax that is contrary to all humanitarian ideas and consideration for the urgent needs of the sick and indigent. Is any one ready to declare that the exigencies of this nation demands such callous and inhuman treatment of our invalids? We are passing through one of the worst epidemics of sickness that has ever afflicted any nation, and many of the common remedies, such as sweet spirit of nitre used in the treatment of this fever in enormous quantities, by reason of the alcohol tax can be supplied only at prices three or four times the normal cost. To now propose to double the tax on alcohol means practically the doubling of the already excessive prices on many of the remedies used in professional medical practice as well as in domestic treatment.

A short review of the various excise taxes upon proof spirits may not be amiss. By the Act of July 1, 1862, the excise tax on proof spirits was fixed at 20 cents per wine gallon. Under the stress of the War of the Rebellion, this was successively increased by the Acts of March 7, 1864, and June 30, 1864, to 60 cents and $1.50 per proof gallon, respectively, and by the Act of December 22, 1864, it was increased to $2.00 per proof gallon. After the war was over, it was recognized that this excessive war tax was no longer necessary and by the Act of July 20, 1868, the tax on proof spirits was fixed at 50 cents per gallon. The Act of March 3, 1875, increased this tax to 90 cents, and early in the 90's it was advanced to $1.10 per proof gallon, and the latter figure was retained until 1917, when, under the necessity for war revenue, it was doubled.

Congress, nevertheless, by various enactments, has demonstrated in the past its appreciation of the fact that the industries of the country that must necessarily use alcohol as a raw material, should not be burdened with a heavy tax on this material, and likewise that for humanitarian reasons the price of medicines should not be unnecessarily increased. In 1893, the Hoar Bill was passed, making provision for tax free alcohol for use in the arts and for medicinal preparations. This measure provided that the tax collected by the Internal Revenue Department was to be rebated to the manufacturers after regulations prescribed by the Secretary of the Treasury had been satisfactorily complied with. The Secretary of the Treasury failed to formulate regulations for making this act effective, and in 1896 it was repealed.

Congress has since reaffirmed this principle and further demonstrated its interest in certain manufacturers using alcohol as a raw material by passing the Denatured Alcohol Act of June 7, 1906, and the several later amendments thereto, by which many industries which can use the various formulas for denatured alcohol, are permitted to use alcohol in this form free of excise tax. The stumbling block in the Hoar Bill, namely, the regulations for the rebate of the tax collected was eliminated in these laws, as provision is made therein for the withdrawal of alcohol denatured under the regulations without any payment of the excise tax on distilled spirits. There are some other manufacturers, however, such as those who manufacture pharmaceuticals, flavoring extracts, perfumery and toilet articles, who, from the very nature of their products, must have pure alcohol as a solvent because of the very necessity to preserve the standard and purity of their products. These equally important industries have been discriminated against and denied by Congressional enactments and the Treasury Department regulations the privilege of using tax free alcohol that has been extended to the other favored industries.

It is fair to assert that no other industry has such a strong appeal for freedom from taxation as the industry that supplies medicines to the needy and sick of the nation; yet, because this industry must necessarily have pure alcohol as a solvent, it is burdened with an excessive tax, which must ultimately be borne by the consumers of the medicines produced. To the pharmacists and chemical manufacturers, who produce the necessary medicines, alcohol as a solvent has no further consideration than has water or glycerin as a solvent where such is essential to the production of their products.

It will be recognized that the tax on distilled spirits has always been viewed by Congress rather as a question of revenue than as a means of producing prohibition. The moral or prohibition argument does not enter at all into the question now under consideration. A manufacturer who prepares a lacquer to preserve our ornaments or the varnish or paint to adorn and preserve our homes can have tax-free alcohol, but the pharmaceutical manufacturer who prepares medicines to preserve the human body as a suitable habitation for the soul, is denied this same privilege. A tax on the water used as a solvent would be quite as justifiable as a tax on the alcohol used for the same purpose.

G. M. B.

THE VALUE OF THE MICROSCOPE IN THE DRUG STORE.[1]

By Heber W. Youngken, Ph.G., Ph.D.

The object of this paper is to point out the advantages of the microscope as applied to the needs of the average retail pharmacist.

The writer in his frequent visits to various drug stores, has been astonished at the comparatively small number possessing microscopes, especially in view of the fact that the pharmacognostic standards for many U. S. P. and N. F. drugs are very exacting. This condition is not without a reason. He has therefore inquired of students and pharmacists why the microscope is not made use of in determining the purity of the various crude, granulated and powdered drugs and spices handled. Several have essayed it to be something non-essential because they deal with reputable houses. Others have admitted it to be of value but claim the time required to examine drugs microscopically would be out of proportion to the profits accrued.

I am well aware that all thinking business men measure their time in terms of dollars and cents and so, if they can be shown a way to make the dollars, they will surely grasp it.

Two of the telling points in business are confidence and service. There must be confidence on the part of the purchaser that the article for sale is worth what is asked for it and, moreover, that it is exactly what is asked for. A dissatisfied customer will seldom return. To secure the confidence of one's customers is more essential in the pursuit of pharmacy than practically any other line of business enterprise. The very fact that the public is aware of the poisonous nature of a number of drugs makes it alert to view any mistake made by the pharmacist as an act of gross incompetence. Quite frequently, minor errors on the part of pharmacists have been seized upon and magnified to others with a resultant diminution of their confidence and a consequent loss of considerable trade.

Just recently I was shown a sample of sweet marjoram purchased in a one-ounce carton from a local druggist by one of my neighbors. The neighbor contended that it was "rubbish." When

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[1] Read at the annual meeting of the Pennsylvania Pharmaceutical Association, Wilkesbarre, Pa., June, 1918.

I examined it, I found that the drug was not only ancient but admixed with hair, dirt, foreign stems and a foreign leaf. Subsequent microscopical examination showed the foreign leaf to be that of *Coriaria myrtifolia,* a poisonous species, which no doubt was collected with the marjoram. Had this particular druggist purchased his stock of sweet marjoram in bulk and examined it microscopically, he would have saved this customer, for despite all the excuses I could manufacture to protect the druggist, the party vowed he would never go back to that store for anything.

This is but one example of a crude drug adulterated. Numerous others have, and still are being adulterated. Some of the most common might be cited as poke in belladonna, wafer ash bark in euonymus, ruellia in spigelia, fagot cinnamon in saigon cinnamon, European rhubarb in Chinese rhubarb, safflower in saffron, etc., etc.

Many instances can be given showing the value of the microscope in the examination of powdered drugs and spices and the detection of adulteration. For instance, the presence of saw-dust in white pine bark, powdered mullein and elecampane leaves in powdered digitalis, wheat middlings in ground ginger, powdered bombay mace in mace, the endocarp of the olive in ground black pepper, etc.

Not long ago one of my students took occasion to examine some five-grain acetyl-salicylic acid tablets microscopically, which had been purchased by his preceptor at a figure slightly below that of market quotation. He was surprised to find in these considerable corn starch. A quantitative analysis later made by his preceptor showed that the five-grain tablets were composed of three grains of acid acetyl-salicylic and two grains of corn starch. This is but one of the numerous cases that might be cited to show the value of the microscope in determining the purity of chemicals.

Much of what I have thus far shown bears upon the value of the microscope in determining the authenticity of the article. Let us now turn to the money side of the question. This naturally has a strong bearing upon the quality of drugs sold.

Some of our more scrupulous brethren in pharmacy are modestly and quietly examining samples of the drugs they handle and no doubt reaping their reward by the reputation they have gained for handling and dispensing effective medicaments. But how much greater might be the returns, if they were to *advertise the fact* alike to the laity, and to the medical profession.

This could be accomplished through the medium of the press, by having cards posted in conspicuous places about the store, announcing the fact that all drugs entering the store were examined carefully before being dispensed and by placing the microscope in the show window when not in use, accompanied by a neatly printed card explaining the use made of the instrument in passing upon the drugs handled. This form of advertising would soon attract considerable attention and aid in giving the drug store that professional appearance which I regret to state many of the so-called modern drug stores sadly lack.

When the care exercised in selecting and handling drugs and spices becomes generally known to the public, I venture to say that the pharmacist's trade would be greatly augmented. He would further be able to charge and obtain more for his medicines on the basis of professional services rendered.

Finally, the microscope is a valuable asset because its use protects the druggist from incrimination. The Pure Food and Drug Acts of the National and State Governments make it incumbent upon all dealers in drugs and chemicals to sell and dispense only such U. S. P. and N. F. drugs which conform to the standards of the U. S. P. IX and N. F. IV. The Federal and State inspectors may drop in at any time and generally the least expected one.

The mere labelling of a package of ground, powdered or crude drug by the wholesaler, as conforming to the Drug Act does not save the pharmacist from prosecution in case of adulteration, once the package or carton has been opened by him. For an unscrupulous wholesaler could claim that the contents were tampered with by the retailer.

Many will doubtless say, "We can protect ourselves by only handling drugs in cartons sealed and labelled by the wholesaler." Unfortunately for such, that cannot be done in every case of a drug called for, as verified by practical experience.

The druggist not examining his drugs, therefore, makes himself subject to prosecution at any time he sells or dispenses a misbranded article.

It can readily be conjectured through the sad experience of others what effect such prosecution would have upon the reputation of the store and confidence of its customers. Once these have been lost the druggist might as well prepare to move.

I know of no other start to bring pharmacy back to its own than to practice it as it should be practised. Anything worth doing is worth doing well, and he who does it well is duly rewarded, not only in dollars, but in that state of mind which one of our philosophers states to be the main purpose of life, namely, happiness.

THE DETERMINATION OF MORPHINE IN COMPLEX PRODUCTS.[1]

PART I. A REVISION OF THE ANALYTICAL REACTIONS EMPLOYED.

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INTRODUCTION.

Laws aiming at the restraint of the morphine habit in its various forms have been enacted in every civilized country. Consequently, official chemists may be called upon at any time to decide whether morphine is contained in some pseudo-medicinal preparation and to determine its amount. The question arises most frequently in Asiatic countries or in those which receive Asiatic immigrants. In such cases the chemist's task is made more difficult by the fact that the material to be examined is likely to be of Asiatic manufacture and mysterious composition. The problem has been a recurring one to the writer for nearly nine years, commencing with the time when he was attached to a Bureau for the Suppression of Opium Smoking under the Chinese Government. No method to be followed in such cases seems to have been published, but experience has shown the practical need of one.

In the course of his endeavors to supply this want the writer has found so many of the statements made in the literature about morphine to be mutually contradictory, or based on imperfect evidence, that it became necessary to take for granted as little as possible. Some reactions which might have a bearing on the analytical behavior of this base have been studied hitherto only as they throw light on its constitution and not on the quantitative side. All the data pertinent to the present investigation have therefore been carefully revised, and the results are here briefly set forth. A method has been devised, founded on these data, by which morphine in medicinal preparations may be accurately determined. This method, or obvious modifications of it, has a very wide range of applicability —the more so, since it calls for no arbitrary "corrections," but rests on strictly stoichiometrical relations. It cannot be used, however, when the morphine is present in the form of opium. To meet such cases a modification has been devised. This latter can also be used for the examination of opium itself, and is more accurate than the methods at present in use. As a matter of convenience these will be presented in separate communications.

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[1] Read by title at the meeting of the Royal Society of Canada.

DISCUSSION OF THE ANALYTICAL DATA OBTAINED.

Acidimetric Titration of Morphine.—When morphine is dissolved in standard sulphuric acid and the excess of acid is determined by titration with a caustic alkali solution, the amount of morphine may be calculated directly from its molecular weight. Contrary to some statements, and to the writer's own previous belief, it is not necessary to standardize the acid on the alkaloid itself. Some of the writer's earlier experiments did not bear out this view, but it was later found that the acid used had been standardized by a faulty method. By Experiment 1 (see subsequent pages) it is shown that 1 Cc. $\frac{N}{10}$ $H_2SO_4 = 0.0304$ Gm. $C_{17}H_{19}NO_3 \cdot H_2O$ and while theory calls for less by 0.0001 Gm., the difference is within the limit of observational error, so that the theoretical figure 0.0303 should be used. That methyl orange gives the same end point as other suitable indicators in this reaction is shown by Experiment 2, but the correct end point for methyl orange is not the one usually used and is difficult to find with the unaided eye. It is best found by using the spectroscopic method. (*Jour. Amer. Chem. Soc.,* XL, 1918. 873.)

Iodometric Titration of Morphine.—This consists in adding a known volume of decinormal iodine solution to an acid solution of the alkaloid. The resulting per-iodide is filtered out and the excess of iodine determined in an aliquot portion of the filtrate (Prescott and Gordin, *Jour. Amer. Chem. Soc.,* XX, 727). The great value of this method lies in the fact that by it morphine may be determined without being first separated as a free base. So many substances interfere with its applicability, however, as to greatly decrease its value. Its reliability has fallen under suspicion through attempts to apply it to other alkaloids which do not react with iodine in the same way. Experiment 3 shows that the reaction is strictly quantitative, and that the iodine solution need not be standardized directly on morphine.

Iodo-Acidimetric Titration of Morphine.—This method, proposed by Gordin (*Pharm. Archives,* 1899, 2, 313–318) appears so plausible that it finds a place in works on alkaloidal assays, despite Kippenberger's destructive criticism (*Zeit. Anal Chem.* 42, 101–108). Experiment 4 leads to the belief that the sodium tetrathionate formed in the course of the reaction is partly responsible for its entire unreliability.

Extraction of Morphine by Solvents Immiscible with Water-Chloroform-Alcohol Mixtures.—Many solvents have been proposed for the extraction of morphine. Most offer great practical disadvantages. Some are extremely apt to form emulsions with alkaline liquids. others are specifically lighter than water, so that their use entails greater manipulative losses. Those of high boiling-point are very objectionable, as the morphine can only be quantitatively separated from them by re-solution in acid. None of these disadvantages adhere to chloroform-alcoholic mixtures. The writer prefers to use 2 volumes of chloroform to 1 volume of alcohol, as advocated by J. B. Williams (*Amer. Jour. Pharm.,* 1914, 86, 308–312). That four extractions, made under the conditions there defined, will completely separate morphine, is shown by Experiments 5 and 6. The very slight deficiency of morphine at the end of these experiments is within the limit of error due to manipulation, etc., and direct tests establish that no alkaloid was left in the aqueous solution. W. A. Puckner (*Jour. Amer. Chem. Soc.,* 1901, XXIII, 470–473) deprecates the use of ammonium hydroxide for the liberation of morphine, but it should be remarked that his gravimetric determinations were admittedly of no value, while the errors attributed to the use of ammonium hydroxide rather than sodium bicarbonate are less than the smallest error that his volumetric method could detect. He worked with chloroform-alcohol mixtures in which the proportion was 4:1. Kippenberger has published some observations on this subject (*Zeit. Anal. Chem.,* XXXIX, 290), but his paper is not accessible to the present writer. Chloroform-alcohol mixtures extract small quantities of morphine from solution even in the presence of alkaline hydroxides or free mineral acid. In the latter case the morphine is extracted in the form of a salt, as proved by Experiment 7.

Precipitation of Morphine by Ammonium Hydroxide under Various Conditions. Sources and Extent of Loss.—Most standard methods for the determination of morphine depend on its precipitation from acid solution by addition of an excess of ammonium hydroxide or, what amounts to the same thing, from alkaline solution by ammonium chloride. In the majority of such cases alcohol is also added. It is difficult or impossible to precipitate morphine in reasonably pure condition from any solution containing resinous matter without the use of an organic solvent to retain the latter. This precipitation of morphine is never quantitative, and some experiments have been made to exhibit clearly the extent of the errors involved, and their source.

The conditions of Experiment 8 were arranged to conform as nearly as possible to those under which morphine is thrown down in Stevens's assay of opium (*Pharm. Arch.,* V, 41–45). The result closely confirms Stevens's estimate of the losses involved. A mixture of 30 Cc. of water with 8 Cc. of alcohol dissolves 0.05 Gm. of the alkaloid. From Experiments 9 and 10 taken together it may be deduced that variations in the amount of free ammonium hydroxide or of ammonium salts have little effect on the solubility of morphine. The volume of dilute alcohol is the same in both cases, as is (within limit of error) the loss of alkaloid. But while the volume of liquid is only one third of that used in Experiment 8, the morphine held in solution is proportionately more. This is to be accounted for in part by the fact that the precipitates were washed with water instead of a saturated aqueous solution of morphine.

That water has an appreciable solvent action in the morphine is clearly shown in Experiments 12 and 13, though the action is very slight in comparison with that of alcohol. The results of these experiments are in fair agreement with those calculated from the more recent of the very conflicting data on the solubilities of this alkaloid.

Experiment 11 shows that morphine can be precipitated from an aqueous liquid with little more loss in the presence than in the absence of chloroform, and that the precipitation can be effected in a reasonably short time.

Taken all together the writer claims to have shown (1) That the principal loss of morphine in this precipitation is due to alcohol (2) That ammonium salts and ammonia play only a very secondary part. (3) That a long precipitation period is not necessary. (4) That a fairly complete precipitation can be effected in the presence of chloroform and water in a short time. (5) That washing with "morphinated" water only becomes necessary when large volumes are employed.

It is therefore logical to avoid, when possible, the precipitation of morphine in the presence of alcohol. If the latter solvent is used, even approximately quantitative results cannot be obtained.

The Actoin of Barium Hydroxide on Solutions which contain Salts of Morphine.—Many secondary authorities state that morphine is soluble in barium hydroxide solution, but they give no references. While the statement was inherently probable, the point became one of such great importance that it was necessary to verify it. Experiments 14 and 15 show that barium hydroxide dissolves morphine and that the latter is not thus precipiated to any important extent by an excess of sulphuric acid or by starch. Even a large excess of barium hydroxide, however, will not bring morphine completely into solution in the presence of lead, as is shown by Experiment 16. This point is one of practical importance.

Action of Ammonium Salts on Morphine.—It is no new observation that morphine liberates ammonia when evaporated with solutions of ammonium salts, but Experiment 17 was made to show the extent to which this action might produce an analytical error. That the same action is appreciable even at the ordinary temperature is shown by Puckner's results (*loc. cit.*) on the extraction of morphine from its solutions in the presence of a large excess of ammonium chloride.

The Action of Acids on Morphine.—It is well known that several of the stronger acids act on morphine under certain conditions, forming apo-morphine and other derivatives, but the limits of these reactions have not been studied. It is therefore important to know whether morphine is acted upon by these acids under analytical conditions; whether, for instance, appreciable loss of alkaloid will result from evaporation with a certain acid on the water bath. Experiments 18, 19, 20 and 21 indicate that some change occurs when morphine is heated on the water bath, under such conditions as might occur in the course of an analysis, with dilute sulphuric and acetic acids, but that no such change is produced by hydrochloric or salicylic acids. All analytical procedure must be regulated accordingly.

The Reactions of Morphine Tartrate.—A. W. and M. W. Blyth (Poisons: Their Effects and Detections, 4th edition, p. 297) state that morphine tartrate might escape detection "if the expert trusted alone to the usual test of an alkaloidal salt giving a precipitate when the solution is alkalized by the fixed or volatile alkalies; for the tartrates of morphine do not give this reaction, nor do they give any precipitate with calcic chloride." A somewhat similar statement is made in Allen's "Commercial Organic Analysis," 4th (American) edition, Vol. VI, p. 378. No original authority is quoted on the point in either of these works. On the other hand, the British Pharmacopœia states that normal morphine tartrate (Morphinæ Tartras B. P.) gives the usual reactions of morphine salts and of tartrates. The discrepancy between such standard works of reference is a serious one, and under certain circumstances might have unfortunate results. The point raised has, besides, considerable theoretical interest, if the statements of Messrs. Blyth are correct. It is shown by Experiment 22 that the British Pharmacopœia is substantially to be relied on in this matter, and that the assertions in the other two works quoted are not well founded. It would be interesting, if possible, to follows these errors to their source.

The facts above-mentioned as re-established are the basis of the analytical methods to be described in Parts II and III of this communication.

Experimental Data on the Analytical Behavior of Morphine.

Strength of $\frac{N}{10}$ H_2SO_4 *in Terms of Crystallized Morphine,* $C_{17}H_{19}NO_3 \cdot H_2O$. *Experiment 1.*—The acid used was standardized against tartaric acid (Babington and Tingle, *Jour. Soc. Chem. Ind.*, XXXVI, 203–204) and was found to be $\frac{N}{10} \times 1.0032$. The crystallized morphine was purified with unusual care. After weighing it was dissolved in a measured volume of acid, and the solution was titrated against standard sodium hydroxide, lacmoid being the indicator.

Total acid used	= 25.00	Cc.
Acid equivalent to the alkali	= 5.38	Cc.
Acid equivalent to the morphine	= 19.62	Cc.
Weight of morphine used	= 0.6000	Gm.

Consequently 1 Cc. of above acid = 0.03058 Gm. of morphine or 1 Cc. $\frac{N}{10}$ acid = 0.0304 Gm. of morphine, while theory requires

0.0303 Gm., the difference being within the limits of measurement error.

The Effect of Different Indicators on Titrations of Morphine with Sulphuric Acid. Experiment 2.—Two portions of crystallized morphine (0.3000 Gm. each) were dissolved separately in measured volumes of sulphuric acid, the excess of which was titrated with standard sodium hydroxide.

	Lacmoid Indicator.	Methyl Orange Indicator.
Total acid used	= 25.00 Cc.	25.00 Cc.
Acid equivalent to the alkali	= 15.13 Cc.	15.16 Cc.
Acid equivalent to the morphine	= 9.87 Cc.	9.84 Cc.

The discrepancy between the results obtained with these two indicators was therefore 0.03 Cc. of $\frac{N}{10}$ acid, a quantity within the limit of the errors of measurement. In the titration in which methyl orange was used, the end point was observed spectroscopically according to the method described by the writer (*Jour. Amer. Chem. Soc.*, XL, 1918. 873).

Strength of $\frac{N}{10}$ Iodine Solution in Terms of Anhydrous Morphine $C_{17}H_{19}NO_3$. Experiment 3.—The solutions of iodine and sodium thiosulphate were compared with one another. The latter was standardized against potassium bichromate and acidified potassium iodide.

The iodine solution was thus found to be $\frac{N}{10} \times 0.9692$. Purified anhydrous morphine was weighed, dissolved in acid and diluted to such volume that 100 Cc. of the solution contained 0.5336 Gm. of base.

To 25 Cc. of this solution 25 Cc. of standard iodine solution was added. The mixture underwent no change of volume. It was shaken and filtered through glass wool. In 25 Cc. of the filtrate the excess of iodine was determined by titration with sodium thiosulphate.

$Na_2S_2O_3$ used = 5.28 Cc. standard iodine.. Therefore morphine in 12.5 Cc. of morphine solution = 7.22 Cc. standard iodine. Therefore 1 Cc. of $\frac{N}{10} \times 0.9692$ iodine solution = 0.00923 Gm. of anhydrous morphine.

Theory requires 1 Cc. = 0.00920 Gm.

Alkalimetric Measurement in Presence of Sodium Tetrathionate. Experiment 4.—A. A slight excess of sodium thiosulphate was added to 50 Cc. of $\frac{N}{10}$ iodine solution. A measured volume of standard sodium hydroxide solution was added to the tetrathionate thus formed. This was then titrated with $\frac{N}{10}$ sulphuric acid, the indicator being phenolphthalein.

B. A titration was made as in the previous case, but the tetrathionate present was that yielded by 100 Cc. of $\frac{N}{10}$ iodine solution.

C. A measured volume of the standard alkali was added to 50 Cc. of the sodium thiosulphate solution used above. It was then titrated as in A and B.

D. A blank experiment was made in which the standard alkali was titrated against $\frac{N}{10}$ acid without any previous admixture. Titration results:

	A	B.	C.	D.
NaOH solution used	25.00 Cc.	25.00 Cc.	25.00 Cc.	25.00 Cc.
$\frac{N}{10}$ H_2SO_4 required to neutralize ..	10.65 Cc.	9.90 Cc.	12.00 Cc.	12.00 Cc.

The neutrality of the iodine solution used in the above experiments was shown by taking 50 Cc., adding just enough sodium thiosulphate to decolorize it, and testing the resulting solution with lacmoid, methyl orange and cochineal. With all these it gave a neutral reaction.

The Extraction of Morphine by a Mixture of Chloroform and Alcohol (2:1). *Experiment* 5.—Crystallized morphine (0.3000 Gm.) was dissolved in dilute sulphuric acid. The solution was transferred to a separating funnel, and enough ammonium hydroxide was added to make it strongly alkaline, care being taken that the total volume did not exceed 25 Cc.

The solution was well shaken for 3 minutes with 25 Cc. of a mixture of chloroform and alcohol (2 volumes of the former to 1 volume of the latter). The lower layer was separated and the extraction repeated in exactly the same way. In all, four extractions were thus made.

The united extracts were distilled on a water bath, the residue being then dissolved in standard sulphuric acid, the excess of which was later titrated with standard sodium hydroxide solution and lacmoid indicator.

[The standard acid used in this and most succeeding experiments was slightly less than $\frac{N}{10}$, being so adjusted that 1 Cc. = 0.0300 Gm. crystallized morphine.]

Total acid used	= 17.00	Cc.
Acid equivalent to the alkali	= 7.10	Cc.
Acid equivalent to the morphine	= 9.90	Cc.
Weight of morphine extracted	= 0.2970	Gm.

Loss of morphine = 0.0030 Gm, equivalent to 0.1 Cc. of standard acid.

After being extracted as above described, the aqueous layer was slightly acidified and evaporated to small volume. Tested for the presence of morphine by iodic acid, by bismuth potassium iodide and by iodine solution, this concentrate gave in each case a negative result.

Experiment 6.—Pure morphine was dissolved in standard acid. The solution was then titrated with standard sodium hydroxide solution.

Total acid used	= 25.00 Cc.
Acid equivalent to the alkali	= 15.00 Cc.
Acid equivalent to the morphine	= 10.00 Cc.

The titrated solution was faintly acidified with hydrochloric acid, evaporated almost to dryness on the water bath and transferred to a separating funnel, washing in with 10 Cc. of water and 3 Cc. of alcohol. Enough sodium hydrogen carbonate (a saturated aqueous solution) was added to make the whole distinctly but slightly alkaline. The morphine was then extracted exactly as in Experiment 5.

Titration of the residue produced the result which follows.

Total acid used	= 25.00 Cc.
Acid equivalent to the alkali	= 15.05 Cc.
Acid equivalent to the morphine	= 9.95 Cc.

Morphine apparently lost in the extraction was therefore 0.0015 Gm. (= 0.05 Cc. acid) which is within the limit of observational error.

For complete extraction of morphine by this method the initial volume of the aqueous layer should not exceed the volume of chloroform-alcohol taken for each extraction. When the former was 40 Cc. and the latter 25 Cc., it was found that four extractions left 0.018 Gm. (6 per cent.) of the base in the aqueous layer.

When 0.2727 Gm. of morphine was in 50 Cc. of solution it was completely extracted by shaking four times with 50 Cc. of chloroform-alcohol mixture.

Extraction of Morphine Salts by a Mixture of Chloroform and Alcohol. Experiment 7.—Crystallized morphine (0.3000 Gm.) was dissolved in dilute sulphuric acid. The solution was made alkaline by sodium hydroxide, then faintly acid with hydrochloric acid. This acid mixture was then extracted four times with chloroform-alcohol exactly as were the alkaline solutions in Experiments 5 and 6. The extracts were combined, the chloroform and alcohol distilled on a water bath and the residue set aside for further examination.

The acid aqueous layer was made slightly alkaline with sodium hydrogen carbonate and again extracted four times with the same solvent as before. The residue from these extractions was set aside for further examination.

Acid Extract.—This dissolved almost completely in water, leaving only a slight oily cloud of insoluble matter (chloroform?). The solution was acidified with standard acid and titrated with sodium hydroxide.

Total acid added = 5.00 Cc.
Acid equivalent to the alkali used = 5.15 Cc.

A trace of free acid (= 0.15 Cc. $\frac{N}{10}$) was therefore contained in the extract.

After titration, the lacmoid was precipitated by adding a little slaked lime. The solution was filtered, acidified, and tested with decinormal iodine solution. The formation of a characteristic precipitate demonstrated the presence of morphine.

Alkaline Extract.—This was dissolved in a known amount of standard sulphuric acid. The solution was titrated with standard sodium hydroxide.

Total acid used = 15.3 Cc.
Acid equivalent to the alkali = 6.4 Cc.
Acid equivalent to the morphine = 8.9 Cc.

The morphine extracted from the alkaline solution was therefore 0.2670 Gm., so that 0.0330 Gm. must have been extracted from the acid solution in the form of a salt by the chloroform-alcohol mixture.

Precipitation of Morphine by Ammonium Hydroxide under Various Conditions. Experiment 8.—Crystallized morphine was weighed into a stoppered flask and dissolved in 25 Cc. of $\frac{N}{10}$ sulphuric acid. To this was added 8 Cc. of alcohol, 20 Cc. of ether and 5 Cc. of dilute ammonium hydroxide. The now alkaline mixture was well shaken, then allowed to stand over night. It was filtered through a cotton plug and washed with 20 Cc. of ether and a sufficient quantity of morphinated water, in the manner laid down by Stevens for the assay of opium (*Pharm. Arch.*, 1903, V, 41–45). The cotton plug was transferred back to the precipitation flask, into which all morphine in the funnel was washed by a stream of $\frac{N}{10}$ sulphuric acid. When all the morphine had dissolved in this measured quantity of acid, the solution was titrated with standard sodium hydroxide, lacmoid being the indicator.

Total acid used in titration = 25.00 Cc.
Acid equivalent to the alkali = 12.88 Cc.
Acid equivalent to the morphine = 12.12 Cc.

This corresponds to 0.3672 Gm. morphine found.

Weight of morphine originally taken = 0.4172 Gm.
Loss in precipitation = 0.0500 Gm.

Experiment 9.—In this case also precipitation was effected in the presence of alcohol and ether, but the total volume of solution was smaller, and the amount of ammonium hydroxide in excess was observed. Crystallized morphine was weighed into a stoppered flask and dissolved in 2.5 Cc. *N* sulphuric acid. To this 2.5 Cc. of alcohol, 10 Cc. of ether and 7.5 Cc. of 0.36 *N* ammonium hydroxide were added successively. The manipulation which followed was the same as in Experiment 8, except that the washing was conducted with distilled water (10 Cc.) instead of water saturated with morphine.

Since 1 Cc. of this standard acid = 0.0300 Gm.

Titration results:
Total acid used = 15.00 Cc.
Acid equivalent to the alkali = 5.80 Cc.
Acid equivalent to the morphine = 9.20 Cc.
Since 1 Cc. of this standard acid = 0.0300 Gm. morphine
Weight of morphine found = 0.2760 Gm.
Weight of morphine originally taken = 0.3000 Gm.
Loss in precipitation = 0.0240 Gm.

Experiment 10.—The excess of ammonium hydroxide used in precipitation was larger, but the total amount of ammonium salt present was smaller, in this than in the preceding experiment. Morphine was dissolved in 2.0 Cc. N sulphuric acid and precipitated by 8.0 Cc. of $\frac{55}{100} N$ ammonium hydroxide in the presence of 2.5 Cc. of alcohol and 5.0 Cc. of ether. The remainder of the manipulation resembled that of Experiment 9.

Titration results:

Total acid used	= 15.00	Cc.
Acid equivalent to the alkali	= 5.75	Cc.
Acid equivalent to the morphine	= 9.25	Cc.
Since 1 Cc. of this standard acid	= 0.0300	Gm. morphine
Weight of morphine found	= 0.2775	Gm.
Weight of morphine originally taken	= 0.3000	Gm.
Loss in precipitation	= 0.0225	Gm.

Experiment 11.—In this case neither alcohol nor ether were present during the precipitation, their place being taken by chloroform. The time allowed for precipitation was greatly reduced.

Crystallized morphine (0.3000 Gm.) was dissolved in $\frac{N}{10}$ sulphuric acid and the solution was titrated with standard sodium hyroxide.

Total acid used	= 25.00 Cc.
Acid equivalent to the alkali	= 15.13 Cc.
Acid equivalent to the morphine	= 9.87 Cc.

A drop of hydrochloric acid was added to the titrated solution, which was then evaporated to dryness. The residue was dissolved in 5.0 Cc. of water, to which was then added 5.0 Cc. of chloroform and enough strong ammonium hydroxide solution to make the mixture alkaline. Crystallization of morphine was promoted by stirring the liquid and scratching the sides of the containing vessel with a rod. It was allowed to stand 3½ hours from the first appearance of a precipitate. It was then filtered through a cotton plug and the morphine washed with 10–15 Cc. of water. The morphine was dissolved in dilute acid. The acid solution, with the cotton plug, was transferred to a separating funnel, made alkaline, and extracted as in Experiment 5. The morphine thus separated was titrated with $\frac{N}{10}$ sulphuric acid and sodium hydroxide.

Total acid used	= 26.50 Cc.
Acid equivalent to the alkali	= 16.89 Cc.
Acid equivalent to the morphine	= 9.61 Cc.

Comparing this with the titration made at the outset of the experiment, the loss of morphine is equivalent to 0,26 Cc. of standard acid or 0.0078 Gm. of base. Since the extraction by chloroform-alcohol is quantitative, this is loss by precipitation from solution in 5 Cc. of water in presence of 5 Cc. of chloroform.

Experiment 12.—Precipitation was effected in the presence of water only, no organic solvent being employed. Crystallized morphine was dissolved in 2.0 Cc. *N* sulphuric acid. To this was added 8 Cc of $\frac{5.5}{100}$ *N* ammonium hydroxide. The precipitate was allowed to form while standing over night. The remainder of the manipulation resembled that in Experiment 8, but distilled water was used to wash the precipitate.

Titration results:

Total acid used	= 15.00 Cc.
Acid equivalent to the alkali	= 8.55 Cc.
Acid equivalent to the morphine	= 6.45 Cc.
Weight of morphine found	= 0.1935 Gm.
Weight of morphine originally taken	= 0.2000 Gm.
Loss in precipitation	= 0.0065 Gm.

Experiment 13.—A weighed quantity of pure crystallized morphine was shaken and allowed to stand over night with 5 Cc. of water and 10 Cc. of well-washed ether. It was then filtered, without washing, through a cotton plug.

The undissolved residue was titrated.

Total acid used	= 21.1 Cc.
Acid equivalent to the alkali	= 11.3 Cc.
Acid equivalent to the morphine	= 9.8 Cc.

The filtrate was also titrated.

Total acid used	= 2.5 Cc.
Acid equivalent to the alkali	= 2.3 Cc.
Acid equivalent to the morphine	= 0.2 Cc.

From the above we find

Weight of morphine undissolved	= 0.2940 Gm.
Weight of morphine dissolved	= 0.0060 Gm.

Since the weight of morphine originally taken was 0.3000 Gm., a perfect balance is thus established.

The Action of Barium Hydroxide on Solutions Which Contain Salts of Morphine. Experiment 14.—A preliminary qualitative observation showed that pure crystallized morphine dissolved quickly and completely when added to a clear cold solution of barium hydroxide. The following observations show (i) that this action is quantitative and that barium hydroxide does not precipitate morphine from its solution, and (ii) that when barium sulphate is precipitated from an acid solution it carries down no morphine salt with it.

(i) From a stock solution of morphine hydrochloride 50 Cc. was taken and diluted to 100 Cc. by adding a clear cold saturated solution of barium hydroxide. The mixture was allowed to stand, protected from the air, for three hours, then filtered through a dry paper. From the filtrate 50 Cc. was taken. To it was added in succession 50 Cc. of dilute sulphuric acid, 50 Cc. of standard iodine solution and enough water to make the total volume 200 Cc. When the periodide had become crystalline it was filtered through glass wool and 50 Cc. of the filtrate was titrated with standard sodium thiosulphate solution.

(ii) To the same quantity of the same stock solution of morphine hydrochloride 5 Gm. of crystallized barium hydroxide was added. The mixture was allowed to stand over-night, then acidified with sulphuric acid, diluted to 100 Cc. and filtered through a dry paper. To 50 Cc. of this filtrate, 50 Cc. of standard iodine solution was added. The mixture was later filtered through glass wool and 25 Cc. of the filtrate was titrated with standard sodium thiosulphate solution.

(iii) A blank experiment was made using the same quantities as in (i) but substituting distilled water for the barium hydroxide solution.

In all three cases the volume of filtrate titrated corresponded to the same volume of morphine hydrochloride solution.

Titration results:

Volume of sodium thiosulphate solution required to decolorize:
(i) = 9.45 Cc. (ii) = 9.50 Cc. (iii) = 9.40 Cc.

The agreement of the results may be considered very satisfactory when the error introduced by the large amount of barium sulphate precipitate is taken into consideration.

Experiment 15.—The question was raised as to whether, when starch is precipitated by barium hydroxide in the presence of morphine salts, any morphine is carried down in the gelatinous precipitate.

A paste was made by the action of hot water on one Gm. of starch. To this was added 20 Cc. of a stock solution of morphine hydrochloride, then 10 Gm. of barium hydroxide dissolved in hot water. The mixture was cooled, diluted to 100 Cc. and filtered through a dry paper. From the filtrate 50 Cc. was taken, acidified, and mixed with 25 Cc. of standard iodine solution. The mixture was diluted to 100 Cc. and filtered. An aliquot portion of the filtrate (50 Cc.) was titrated with sodium thiosulphate solution.

Volume of sodium thiosulphate solution used = 3.6 Cc. In a blank experiment the corresponding result was 3.4 Cc.

The difference corresponds to 0.0011 Gm. of anhydrous morphine in the fraction titrated, or 0.0044 Gm. of the total original amount.

Combined Action of Lead Salts and Barium Hydroxide on Morphine. Experiment 16.—A few Cc. of basic lead acetate solution was added to 25 Cc. of the same stock morphine hydrochloride solution used in Experiment 15: Barium hydroxide solution was added in excess till the total volume was 250 Cc. The mixture was filtered. One hundred Cc. of the filtrate was acidified and 25 Cc. of standard iodine solution was added, then enough water to make up to 250 Cc. The periodide was filtered out and 125 Cc. of the filtrate titrated with standard sodium thiosulphate solution. A blank determination of morphine was made at the same time.

Sodium thiosulphate solution required

(i) In main experiment	7.6 Cc.
(ii) In blank experiment	3.4 Cc.

Since 1 Cc. $Na_2S_2O_3$ sol. = 1.0638 Cc. iodine solution and 1 Cc. iodine solution = 0.008285 Gm. of anhydrous morphine.

10 Cc. of the stock solution of hydrochloride used above = 0.1464 Gm. of anhydrous morphine, of which amount 0.0735, or more than half, was precipitated by the lead in the foregoing experiment.

The Action of Ammonium Salts on Morphine. Experiment 17.—Crystallized morphine (0.3000 Gm.) was dissolved in standard sulphuric acid and the solution was titrated with standard sodium hydroxide. The titrated liquid was made faintly acid with hydrochloric acid and then evaporated to small volume. A slight excess of ammonium hydroxide was next added and the evaporation continued to dryness. The residue was drenched with a further small amount of ammonium hydroxide and again warmed on the water-bath to complete dryness. The resulting mixture was dissolved in standard sulphuric acid and titrated with sodium hydroxide solution to determine the amount of free morphine unacted upon by the ammonium salts.

Titration results:

	I Before evaporation with NH_4Cl.	II After evaporation with NH_4Cl.
Total acid used	25.0 Cc.	25.0 Cc.
Acid equivalent to the alkali	15.0 Cc.	16.7 Cc.
Acid equivalent to the morphine	10.0 Cc.	8.3 Cc.
Weight of free morphine	0.3000 Gm.	0.2490 Gm.

The difference (0.0510 Gm., or about one sixth of the whole) was evidently converted into morphine salt at the temperature of the water-bath.

The Action of Acids on Morphine. Experiment 18.—From a stock solution of morphine hydrochloride 25 Cc. was taken, mixed with 5 Cc. of hydrochloric acid (sp. gr. 1.2) and 50 Cc. of alcohol, and boiled under a reflex condenser for 5 hours. The mixture was then evaporated on a water-bath to about 20 Cc. and the morphine content, as determined by the iodine method, compared with that of 25 Cc. of the original stock solution.

	Sample treated with HCl.	Blank experiment.
Sodium thiosulphate used in titration	9.20 Cc.	9.25 Cc.

Experiment 19.—A. Ammonium hydroxide was added to 25 Cc. of an acid solution of morphine sulphate till it became neutral. It was then acidified with 10 Cc. of hydrochloric acid (sp. gr. 1.2) and the whole was evaporated to about 10 Cc. The solution was then diluted and the morphine estimated by the iodine method.

B. The same volume of morphine solution was treated in the same way as the foregoing, but that 5 Cc. of glacial acetic acid diluted with 25 Cc. of water was substituted for the hydrochloric acid.

A blank experiment was made on the same volume of morphine solution, its strength being determined by means of iodine without any previous evaporation.

	Volume of $Na_2S_2O_3$ solution used in titration.
Blank experiment	4.50 Cc.
Determination A (after HCl)	4.45 Cc.
Determination B (after CH_3COOH)	4.15 Cc.

The acetic acid itself had no influence on the iodine. When 25 Cc. of the standard iodine solution was allowed to stand for 2½ hours with 10 Cc. of the same glacial acetic acid as that used above, no solid separated. The mixture was diluted and titrated with sodium thiosulphate.

Volume of Iodine solution.	Volume of Acetic Acid.	Volume of $Na_2S_2O_3$ solution required.
25.0 Cc.	10.0 Cc.	25.4 Cc.
25.0 Cc.	0.0 Cc.	25.4 Cc.

Experiment 20.—This was conducted on the same lines as Experiment 19, but sulphuric acid (2 Cc. concentrated acid suitably diluted) was used instead of hydrochloric. The stock solution of morphine sulphate not being the same, a separate "blank" was necessary for comparison of strength.

	Solution Evaporated with H_2SO_4	"Blank" Experiment.
Sodium thiosulphate solution used in titration	7.7 Cc.	7.4 Cc.

Experiment 21.—This was conducted on the same lines as the foregoing experiments, substituting a considerable excess (about 0.5 Gm.) of salicylic acid for the acids previously used. The stock solution of morphine was not the same.

	Solution Evaporated with Salicylic Acid.	"Blank" Experiment.
Sodium thiosulphate solution used in titration	17.55 Cc.	17.50 Cc.

The Reactions of Morphine Tartrate. Experiment 22.—A solution was made containing 0.3 Gm. of morphine tartrate (B. P.) in 10 Cc. of water. The following tests were applied to different portions.

A. With ammonium hydroxide, the white crystalline precipitate, characteristic of morphine, was obtained.

B. With iodine dissolved in potassium iodide and water, acidified with sulphuric acid, a characteristic precipitate formed.

C. Potassium-bismuth iodide gave a red precipitate.

D. With dilute iodic acid, iodine was at once liberated.

E. Neutral calcium chloride solution gave no precipitate, but when made slightly alkaline with dilute ammonium hydroxide before being added to the morphine tartrate, a white gelatinous precipitate formed on completion of the mixture. This precipitate had the usual appearance of calcium tartrate.

The morphine tartrate solution was almost neutral to litmus, though distinctly acid to phenolphthalein. It is probably this degree of acidity which prevents the formation of calcium tartrate in a solution not rendered alkaline by ammonium.

SOME OBSERVATIONS ON THE DISSOLVING OF ZINC CHLORIDE AND SEVERAL SUGGESTED SOLVENTS.[1]

By Josiah C. and Bertha L. DeG. Peacock.

The salts of zinc which are soluble in water, especially the sulphate, acetate and chloride, have long been used in injections, lotions, eye-washes, mouth-washes and other such forms of application, usually in weak solutions, a few grains to the ounce.

The sulphate and acetate of zinc readily dissolve in water without residue; but zinc chloride upon contact with water has a strange behavior; and when treated with water in large proportions leaves an insoluble residue known as oxychloride, or basic chloride of zinc; it matters not which is added to the other. This undissolved portion is bulky, therefore impressive as to quantity especially when resulting from one or two grains of zinc chloride intended for eye-drops. That it does contain both zinc and chlorine, we have assured ourselves by qualitative analysis; it may therefore be rightly termed basic chloride of zinc, or oxychloride. Whatever of oxide of zinc or oxychloride of zinc was present in the sample dissolved may also be looked for here.

In order to appreciate the quantity of oxychloride usually left undissolved, let us cite a reference found in the proceedings of the American Pharmaceutical Association, 1896, page 715—"Zinc

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[1] Presented at the meeting of the Pennsylvania Pharmaceutical Association, Wilkesbarre, Pa., June, 1918.

Chloride-Dissociation by Water." "Perrot has observed that when zinc chloride, free from oxide was dissolved in water, a precipitate was formed, which had the composition $ZnCl_2$, $5ZnO6H_2O$. An inquiry into the relations of the quantity of water to the amount of oxychloride formed resulted in the determination that by employing 100 mol. of water, 3.25 per cent. of oxychloride was formed, the same quantity was formed with 75 mol., 3 per cent. was formed with 50 mol. and 2.6 per cent. with 25 mol.

The limit of the reaction is, therefore, with 75 mol. of water, the addition of large quantities giving no increase in the yield of oxychloride. *Pharm. Centralh.*, January 23, 1896, 46 from *Bull. Soc. Chim.*, 1895, 975."

Commercial zinc chloride may contain some preëxistent oxychloride as an impurity from overheating in manufacture, and samples of medicinal zinc chloride such as the official grade are expected to show a separation of oxychloride under the condition named; the United States Pharmacopœia accordingly provides a test for limit of oxychloride.

The equation commonly used to explain the change of zinc chloride through the effect of water into this basic salt is

$$ZnCl_2 + H_2O = Zn(OH)Cl + HCl.$$

As already mentioned the precipitate is strikingly bulky, but is by no means a great part of the zinc salt taken. The production of free hydrochloric acid as shown by the equation, is perhaps the reason that all of the zinc is not precipitated by the water. A proper conception of this reaction demonstrates the fact that every clear solution of zinc chloride that is obtained by dissolving zinc chloride in a large quantity of water is a solution of zinc chloride plus hydrochloric acid. This is a matter to be noted toward a better understanding of the behavior of this peculiar substance, for although at this point the statement is largely inference, it will, in due course, become a proven fact.

Even though the undissolved matter is no great part of the zinc chloride, it does of course, represent activity which it is the duty of the pharmacist to vouchsafe to the patient. Therefore, to remove it would be wrong, to dispense it in eye-drops, or similar preparations, would be useless, if not productive of more serious trouble than an explanation.

When first we encountered this behavior we could not take time to investigate it, so acting under the impression that free hydrochloric acid would be present in any event, as shown by the equation, we concluded that the most practical thing to do was to supply that through lack of which the obstacle arose; in other words, add sufficient hydrochloric acid to the zinc chloride itself to enable the water to carry all of the zinc chloride into solution, realizing as already said, that free hydrochloric acid would be present in the finished product whether all or only part of the zinc chloride was in solution, for this procedure assures the zinc to the patient.

The addition of the hydrochloric acid was made in the case of several grains of zinc chloride by putting a single drop of concentrated acid upon the salt and after mixing by trituration the water was added. When but a grain or two of zinc chloride was to be dissolved, a mere trace or touch of the acid was used, or portion of a drop of diluted acid. Much less acid is needed if put directly upon the zinc salt. Any mixture prepared without this addition and showing turbidity was rejected because too much acid would have to be added to the fluid. The effect of the acid added is to produce zinc chloride and water.

$$Zn(OH)Cl + HCl = ZnCl_2 + H_2O,$$

the very material desired in the product. We have often wondered "what better can be done?" Theory would indicate that the hydrochloric acid in the liquid could be neutralized by mixing it with zinc oxide or carbonate and filtering off the undissolved portion. This plan however is neither so accurate nor so simple as it appears when tried on a small lot of eye drops.

Although the plan of adding acid had been used for many years, without any untoward effects, there might have arisen a comparison between the work of dispensers, wherein the reason for such an addition might be difficult of explanation to the lay mind; for although we believed we were acting within the bounds of right judgment, it might not have been possible to satisfy the patient that such was the case. Nor was the patient the only one who might have to be convinced of the commonsense of the plan, as we shall soon learn; and it was this apprehension perhaps, more than any other influence, that persuaded us to look for another solvent.

Since undertaking this study of the subject, we find that others have practiced this method as the only practical means of dissolving zinc chloride.

Indeed we find that this problem had been referred to a commission of apothecaries and physicians in Belgium, because physicians were objecting to the use of the acid. This body discountenanced the use of the acid, and recommended the use of a turbid solution or the clear liquid therefrom, either of which, as has been pointed out, will contain the same amount of free hydrochloric acid, *produced but not added.* Referring to the report of this commission, Dr. Paul Wiskirchen, in the *Pharm. Zeitung,* 1899, page 268, states that he finds "the addition of acid is unnecessary. He finds that if it is attempted to dissolve pure zinc chloride in cold water, or if cold water is added to a clear solution of zinc chloride, turbidity is invariably produced, but if the solution is effected with hot water, or if the dilution is made with hot water, clear solutions result, and so remain permanently." This quotation is from the proceedings of the American Pharmaceutical Association, 1900, page 717, for which it was abstracted from the *Pharm. Centralhalle* of August 17, 1899, page 508. In the same Proceedings for 1907, page 850, we find another abstract, which we quote in its entirety.

"Zinc chloride—Simple Method to Effect a Clear Solution. Franz Wippern directs attention to the fact that while pure zinc chloride usually produces a turbid solution when it is dissolved in cold water, it dissolves perfectly clear in hot water and the solution remains clear on cooling. *Pharm. Zeitung,* Li, No. 73, 1906, 807." Wondering whether we had shut our minds to such a simple and efficient agent as hot water, we hastened to try the suggestion, but only to be utterly disappointed, for we found no appreciable difference in either the immediate or prolonged effect of hot or cold water, in dissolving the salt, or diluting concentrated solutions. If there is any perceptible difference in the effect of hot water from that of cold water, it is merely in making the sediment more dense and to settle somewhat faster, perhaps to be overlooked more easily. Not satisfied to record a refutation of these statements without sufficient proof, we made dozens of tests under varying conditions and quantities, but all to no avail. The statements are erroneous. It was now decided to look into the properties of zinc chloride itself as the most rational starting point of our quest.

One of the characters of zinc chloride which should be borne in mind throughout the consideration of this subject is that property of its solutions to turn litmus from blue to red, or, as usually described, its acid reaction. As is well known this property is common to many of the soluble salts of the metals; we merely want to remind ourselves at this time that it does not indicate free acid. The sample of zinc chloride which was employed for these experiments conformed to the U. S. P. requirements as to limit of oxychloride content and production; it also conformed to the other tests of the same standard. After a number of experiments made more or less at random to determine features which seem to have bearing upon the matter in hand, a series of experiments was outlined through which it was purposed to follow some zinc chloride in order to note its behavior under varying conditions.

Accordingly, a convenient portion of it was placed in a vessel and water added drop by drop with constant stirring. Approximately an equal weight of water dissolved it—the mixture becoming warm as solution progressed—and a practically clear solution resulted. The addition of water in small portions was continued until a decided precipitate made its appearance. These experiments were repeated several times with different amounts of zinc chloride. On an average it required over five times as much water as zinc chloride to produce a permanent turbidity or precipitate. The further dilution of these turbid solutions with water, threw out more precipitate, so the addition of water was continued until to all appearances no more oxychloride was being produced. This condition appeared to be attained when twenty or more parts of water had been added.

One of these mixtures was allowed to settle and the clear supernatant liquid decanted upon asbestos wool. The filtrate was placed upon a water bath for evaporation. The undissolved portion (oxychloride) was washed and boiled with sodium carbonate to separate the zinc and chlorine, both of which were shown to be present.

Before passing on to the consideration of the evaporated filtrate let us observe some of the behaviors of the clear solution of equal parts of zinc chloride and water. The statement is common in works of reference that zinc oxychloride is dissolved by zinc chloride solution; now the fact, that up to a certain dilution a clear solution of zinc chloride is possible must certainly be conceded to be proof of this statement.

The inference then would be that the total acidity of the zinc chloride solution is sufficiently powerful in that certain concentration to hold in solution any oxychloride which existed in the sample as well as to prevent the separation of the incipient oxychloride which will be manifested upon a further dilution.

Looked at from the view point which attaches to precipitated oxychloride another significance to be gathered from this phenomenon is that there is a limit to the ability of the acidity of the zinc chloride solution to hold the oxychloride in solution, and as through gradual dilution this power suffers attenuation the separation of oxychloride progresses until exhaustion is attained when down comes such balance of zinc in the form of oxychloride as the weakened acidity of the solution can no longer hold dissolved.

The present acidity of the solution, must, therefore, be looked upon as the only reason that all of the zinc is not thrown out in preparing clear zinc chloride solutions by dissolving or diluting with water.

That this acidity must be sufficient, though not necessarily of a related form, was proven through a fortunate thought which occurred just before finishing the work upon these tests; namely, zinc chloride can be dissolved in a well-charged carbonic acid water, without residue of oxychloride; and further evidence that acidity is essential was shown by the fact that if this same solution is boiled or agitated to expel the carbon dioxide, the insoluble oxychloride appears. Boiling caused its immediate separation, agitation revealed it but slowly, while quiet maintained a clear solution for over four days; when afterwards the application of heat caused the escape of a few bubbles of gas, and the looked-for precipitate appeared. But for its fleeting nature, what could be better for our need? That there may be a trace of oxychloride yet held in solution by the combined acidities of the zinc chloride and free acid which have ever enveloped it, would be difficult indeed to prove, but it was proven that a clear solution of zinc chloride of greatest strength possible will not dissolve oxychloride which has been previously separated from a solution. A portion of the cold, clear concentrated solution of zinc chloride was mixed with a small amount of zinc carbonate without change in appearance, but upon boiling the mixture the zinc carbonate dissolved. Even after no more carbonate would be taken up the solution retained its power to redden litmus. On the other hand, a clear solution of zinc chloride from which oxychloride has been completely separated by sufficient dilution, did not dissolve zinc oxide or carbonate, even upon prolonged digestion with heat, thus indicating that in this dilution the affinity between the zinc oxychloride and hydrochloric acid as a balanced condition within the solution is greater than between the zinc oxide and hydrochloric acid.

The liquid was evaporated upon the water bath to nearly constant weight. It was now in the form of a thick syrupy liquid; for zinc chloride cannot readily be dried on a water bath under atmospheric pressure. Besides what moisture it retains this syrupy residue would be expected to also contain the hydrochloric acid from the reaction producing the oxychloride from which it had been filtered; later it will be shown that it does contain this hydrochloric acid.

Two series of experiments, with this syrupy residue, were arranged. In the first of these it was mixed with water gradually added and finally increased to a considerable bulk to find that it dissolved clear throughout. It was then re-evaporated under the same condition to a syrupy consistency and again found to dissolve clear; a third such treatment was given it, and a third time it dissolved clear. The reason for its doing so was the presence of a sufficient amount of hydrochloric acid, tenaciously retained throughout the evaporation, to effect solution, as was proven to be the case by treating the syrupy liquid of the second series of experiments with zinc carbonate. When put into the syrupy liquid the zinc carbonate made no demonstration of the presence of acid until the mixture was thinned with just sufficient water to permit of enough motion for reaction. Effervescence then took place with the disappearance of the small amount of zinc carbonate which had been added. More zinc carbonate was now added until in excess, and the solution warmed, gradually but abundantly diluted with water, and filtered. The clear liquid would now be considered as containing no free hydrochloric acid. Next, it was evaporated to a syrupy consistency on a water bath, and then mixed with water, as had been done in the experiment just preceding it. Instead of dissolving clear as the preceding one, the present experiment gave with first portion of water a clear solution but upon further dilution an abundant residue of oxychloride. This was separated and the filtrate evaporated as before, and upon treatment with water gave a clear solution, thus showing that the acid which was produced in the solution, along with the oxychloride, was sufficient to redissolve all of the zinc chloride. Another evaporation and solution substantiated this opinion. The liquid of the first series was now evaporated for the fourth time, and after it had reached the syrupy consistence, the vessel was placed over a direct flame, and the heat continued, while tests were made from time to time, by removing a drop with a glass rod, until a point was reached when a drop gave a turbidity with water. This stage was not attained until after and in succession the last trace of moisture which had been held so tenaciously by the zinc chloride and the adhering hydrochloric acid had been driven off and the zinc chloride had been liquefied by the heat, giving additional evidence that adhering hydrochloric acid had been the reason for this syrupy liquid persistently dissolving clear. The fused residue was now treated with an abundance of water and the mixture filtered. This filtrate was evaporated to a syrupy condition as before and found to dissolve clear in water. Another fused mass corresponding to that just described was treated with a limited quantity of water and upon filtering, evaporating and again diluting, oxychloride separated, because when the mass was treated with the limited quantity of water not enough water was present to adjust the acidity so that the full production of oxychloride might take place. The insoluble portions of the fused masses were all shown by tests to be oxychloride.

In order to observe a specimen of zinc chloride which had never been in a solid state and thus avoid oxychloride due to overheating, a concentrated solution was prepared by saturating warm hydrochloric acid with zinc oxide added in excess. The clear supernatant liquid from this mixture precipitated with both hot and cold water and in all respects corresponding dilutions behaved exactly as those obtained from the dissolved salt. One could imagine nothing more likely chemically neutral than this solution prepared by neutralizing the acid with the zinc base; and its precipitation by water must convince the most skeptical that free acid is not only present in every diluted zinc chloride solution prepared with water alone as the solvent, but also that it is needed to insure complete solution.

Neutralize such diluted solution in part, and simultaneously with the precision of natural law readjustment takes place between the zinc chloride and the water present, with the formation of oxychloride and the production of a corresponding amount of free acid; there will be free hydrochloric acid in a diluted solution made with water alone while there is zinc chloride left in it.

Any amplification of these experiments will but reiterate the proven fact, at first but inference—that when this dilution is reached there has been formed and retained hydrochloric acid, and sufficient of it to re-dissolve the residue in any amount of water that may be added.

So much for our study of zinc chloride under the conditions of ordinary manipulation by the pharmacist; and like every definite chemical substance it always behaves the same under identical conditions no matter how often they recur.

Still the problem how to get zinc chloride into solutions of such strength as ordinarily called for in prescriptions without loss, remained unsolved. Left as we were to make the best of what cannot be changed, one might decide, and with sanction of authority, as previously pointed out, to prepare a solution of zinc chloride and ignoring the slight precipitate, ascribe to it an approximately definite strength and of this take sufficient quantity as needed. Such course is perhaps the next best plan to getting the zinc salt entirely dissolved, but the accomplishment of the latter was what had prompted the work; and yet meditation seemed to be but closing the door to possibility.

While reviewing numerous experiences with zinc chloride in prescription work, it was thought that there was a possibility of boric acid being the agent sought. It had been used a great many times in eye-washes with zinc chloride but had never been depended upon for solvent effect. Its suitability to eye washes and its mild acidity, however, strongly urged a trial, and the first experiment showed that it has the very property desired, while subsequent trials established the fact that boric acid will give clear solutions with zinc chloride, grain for grain, in any dilution, hot or cold, up to about twenty grains per ounce. Boric acid applied to the zinc chloride will prevent the precipitation of zinc oxychloride; it will also redissolve a precipitate of oxychloride, although proportionately more is then required than is needed to prevent the precipitate. A saturated solution of boric acid is a convenient form in which to employ the agent, adding it directly to the zinc chloride, or the reverse. Saturated solutions of boric acid at ordinary indoor temperatures contain about twenty grains of boric acid to the fluid ounce; these solutions will dissolve an equal amount of zinc chloride. If such concentrated solutions of zinc chloride are exposed to a lower temperature, they become cloudy, peculiarly so, and though cleared by warmth they do not retain their transparency.

Solution by means of boric acid may also be accomplished by mixing the boric acid intimately with the zinc chloride before the aqueous solvent is applied. This plan involves some allowance for the slow solubility of the boric acid itself. Solutions of zinc chloride by means of an equal amount of boric acid are permanent, with the exception of the saturated solution as already mentioned. Less than an equal amount of boric acid does not appear to insure permanency.

The limit of solubility of boric acid is the only shortcoming of this agent so far observed. It is of interest to note for subsequent comparison, that upon boiling zinc oxide or zinc carbonate and boric acid together, no zinc enters solution.

While little, if any, objection can be raised to the use of boric acid in this connection, yet because of its limited effect, we sought for another solvent less restricted. Attention had been arrested by a reference to the soluble double salts which zinc chloride forms with ammonium chloride, and effort was turned in that direction. The results with boric acid had strengthened the belief that an acidulated medium is essential to the purpose, and associating this thought with the fact that solutions of ammonium chloride are prone to redden litmus, unquestionably through the presence of a trace of free hydrochloric acid, it was undertaken to learn what effect ammonium chloride would have in the dissolving of zinc chloride. Gratifying, indeed, was it to find the substance a very efficient solvent, and more powerful than boric acid, for applied directly to the zinc chloride one grain of ammonium chloride will dissolve five grains of zinc chloride. If used to dissolve a precipitate of oxychloride an additional amount may be needed, apparently dependent on strength of solution. The solutions with ammonium chloride are permanent.

There would seem to be no objection to the use of the few grains of ammonium chloride which would be needed to prepare an application for a mucus membrane since such parts are constantly saturated with solution of chlorides and likewise inured to the presence of ammonium compounds. Should a very strong solution of zinc chloride be needed as for powerful local effect, ammonium chloride may be depended upon to yield a clear solution.

The possibility of decomposing ammonium chloride in solution, with zinc oxide, in the capacity of an alkali and alkaline earth, had not come to mind until now. Upon boiling zinc oxide with a solution of ammonium chloride it was found that the zinc oxide dissolved, of course, with the inevitable liberation of ammonia. Zinc carbonate behaves in this same manner with ammonium chloride. A parallel test with water was made to check up these results against any soluble zinc impurities in the oxide and carbonate. Herein may be considered to abide the solvent effect of ammonium chloride on zinc oxychloride—an effect again attributable to acidity of medium.

Representing the action by the equation:

$$Zn(OH)Cl + NH_4Cl \text{—} ZnCl_2 + H_2O + NH_3,$$

ammonia gas might at first be expected to be in evidence. But when it is recalled that free hydrochloric acid is present or producible in a quantity definitely proportionate to the oxychloride to be dealt with, it is readily understood that no ammonia should be evolved, nor was any, as proven by test.

Sodium and potassium chlorides have no solvent effect upon zinc chloride, but ammonium chloride gives a clear solution of zinc chloride in normal salt solution, and so does boric acid.

A sample of zinc ammonium chloride, was prepared by adding to a solution of zinc chloride of known strength the calculated amount of ammonium chloride to supply an equal number of molecules of the two salts. Crystallization of this solution yielded a product which was recrystallized to obtain the sample shown at this time. The identity of the product was established by tests.

Zinc ammonium chloride forms colorless, transparent crystals, without odor and having an intensely caustic taste. It is readily and completely soluble in water; the aqueous solution is acid to litmus; the solution remains permanently clear. This salt is not an article of commerce in channels through which the pharmacist trades, nor is its use suggested, for the acquisition of it needlessly increases one's stock, especially since boric acid and ammonia chloride must always be at hand.

Since medicated waters are frequently used in solutions for treating conditions wherein zinc chloride is likely to be employed, some experiments were made to observe the behavior of these liquids toward zinc chloride. Peppermint water was found to act as does distilled water; but with boric acid or ammonium chloride yields clear solutions. Camphor water was found to possess acidity sufficient to dissolve zinc chloride up to ten grains per ounce. Beyond that strength camphor water takes on a satiny opalescence due to the separation of microscopic crystals of camphor. The addition of ammonium chloride increases this opalescence. But with or without ammonium chloride these camphor crystals reënter solution within a few days, or immediately upon the addition of a few drops of alcohol. The samples of rose water at our command were neutral to litmus; they did not dissolve zinc chloride completely until boric acid or ammonium chloride was added. An experience some time past, but well remembered, leads us to believe that specimens of rose water may be encountered which will give clear solutions.

Mucilage of sassafras pith did not dissolve the zinc chloride, until boric acid or ammonium chloride was added; but though the zinc oxychloride went into solution the mucilage was rendered cloudy by its contents.

The statement that zinc chloride forms soluble double salts with some alkaloids as well as with ammonium chloride was tried out with some of those used in eye-washes, with the following results: Equal parts of morphine hydrochloride and zinc chloride did not yield a clear solution, until ammonium chloride was added. Equal parts of pilocarpine hydrochloride and zinc chloride did dissolve clear. Equal parts of cocaine hydrochloride and zinc chloride did not dissolve clear, without the addition of ammonium chloride; boric acid likewise carried the mixture into solution.

Ammonium chloride produced clear solutions when zinc chloride was brought together with morphine sulphate and atropine sulphate.

Our conclusions, from this mass of experiments and data may be summed up in short as follows: the separation of zinc oxychloride when zinc chloride is dissolved in water is always accompanied by liberation of free hydrochloric acid which remains in the solution, at the same time a loss of zinc is experienced. Both of these objections may be overcome in solutions up to approximately twenty grains to the ounce by the use of boric acid weight for weight of the zinc chloride taken. For solutions exceeding this strength, or for any strength, ammonium chloride in quantity of not less than one-fifth of the amount of zinc chloride used, will insure complete and permanent solution. Camphor water will dissolve only a few grains of zinc chloride per ounce. Carbonic acid water may be employed if intended for immediate use. And finally the comparative ease with which a minute quantity of either boric acid or ammonium chloride prevents a precipitate as against the larger quantity needed to redissolve oxychloride once formed may be impressed upon our minds by the wisdom of that renowned maxim: "An ounce of prevention is worth a pound of cure."

THE LEAST THAT SOME OF US CAN DO.

By Henry M. Whelpley,

ST. LOUIS, MO.

No one escapes having special attention arrested by the world war. This is a crisis in the development of the human race which seriously affects, if it does not actually control our thoughts and activities. All other affairs become extraneous to this cataclysmic action. Some of us have seen too many winters to be of military value. Many are restricted by other conditions. As time passes, the duties for us at home become clearer and clearer. This is a day for patience, courage and endurance; a period of utmost faith and loyalty. All of us must remain one in interest and in sentiment.

Many pharmacists are in the service, more are going soon. They will at once lose their identity as pharmacists. The government will know them only as soldiers and sailors. Let us consider strongly how we can keep alive the fraternal spirit and at the same time aid the boys in developing military efficiency. What better than frequent letters of a cheerful newsy character? This will contribute to contentment and encourage ambition. Show them that we still think of them as pharmacists and are writing because they belong to our calling. This will cause them to place a new value on pharmacy. We would have a pharmaceutical corps in the army today if pharmacists of the past and of this generation fully valued the possibilities of the calling.

But I will avoid being argumentative. This is not the time to ask sharp questions but an occasion for action with one heart. The least that we who remain at home can do is to keep in constant touch with those of our calling whom we know at the front. We must not be divided from our fellow pharmacists even though they are unknown as pharmacists in the army or in the navy.

THE EVALUATION OF BALSAM OF TOLU.[1]

By T. Tusting Cocking and James D. Kettle, B.Sc., F.I.C.

It has been pointed out by several observers that the method of the British Pharmacopœia, 1914, for the estimation of the balsamic acids in balsam of tolu is unsatisfactory. The results obtained are low, as much of the aromatic acid present is combined with resin alcohols and is insoluble in, and thus not extracted by, carbon disulphide.

In 1914 we described a process for the evaluation of benzoin, by which the balsamic acids could be separated from the resinous matter, and the free and combined benzoic and cinnamic acids determined.[2]

The original experiments leading up to this process were carried out on balsam of tolu, and the method was afterwards applied to both benzoin and storax, the results of the former being published.[3]

The method (now official in the British Pharmacopœia, 1914) adopted for the estimation of the aromatic acids in the case of storax[3] was tried on balsam of tolu but abandoned, as repeated extractions by boiling with water caused the resinous matrix to become so stiff and intractable that it was impossible to extract the acids completely.

Boiling out of the aromatic acids with magnesium oxide and water, in the presence of a small quantity of xylene to soften the resinous matter, was found to be the most satisfactory way of dealing with the balsam. The magnesium salts of the aromatic acids are readily soluble in cold water, those of the resin acids being insoluble. A complete separation is effected and the aromatic acids are obtained in a purer condition than by aqueous extraction alone.

The mode of procedure is as follows:

1. *Free Balsamic Acids.*—Five Gm. of the balsam are dissolved in 25 Cc. of hot alcohol in a 250 Cc. CO_2 flask, 5 Gm. of light magnesium oxide, and 20 Cc. of xylene are added, and the flask shaken round until the contents are well mixed. One hundred Cc. of water

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[1] Communication to the British Pharmaceutical Conference for publication in the "Year Book of Pharmacy" for 1918.

Reprinted from *The Pharmaceutical Journal and Pharmacist*, July, 1918.

[2] *Y. B. P.*, 1914, 355.

[3] *C. & D.*, March 16, 1912, and May 25, 1912.

are now added, the flask connected to a reflux condenser and boiled for one hour. After cooling, the whole is poured on a Buchner filter, and the aqueous portion of the filtrate separated from the xylene layer, which is returned to the flask together with the filter paper and adhering magnesia-balsam magma. A second 100 Cc. of water is added, and the flask again boiled for an hour, when the aqueous portion of the filtrate is separated as before and the extraction carried out a third time. The bulked aqueous liquids are washed once with 20 Cc. of ether, then rendered acid with hydrochloric acid, and the precipitated acids extracted by shaking out with ether. The greater part of the ether is distilled off, and the residual aromatic acids dried *in vacuo* over sulphuric acid and weighed.

2. *Total Balsamic Acids.*—2.5 Gm. of the balsam are saponified by boiling with excess of alcoholic potash: most of the alcohol is then evaporated off, the residue dissolved in 100 Cc. of hot water, and sufficient hydrochloric acid added to render the whole slightly acid. Five Gm. of light magnesium oxide and 20 Cc. of xylene are next added, and the whole boiled up under a reflux condenser for 1 hour. The aqueous liquid is separated, the extraction twice repeated, and the bulked aqueous liquids treated as in the case of the free balsamic acids.

The proportion of cinnamic acid is determined by the gain in weight on bromination, details of which may be found in our previous note.[2]

The aromatic acids obtained from balsam of tolu are not quite so pure as those from benzoin and storax. The brominated acids from the two latter are white and pleasant smelling, while those from tolu are slightly brown in color, and contain a substance which is extremely pungent and lachrymatory.

Balsam of tolu, as a rule, contains very little that is not soluble in alcohol, but occasionally samples are met with containing woody matter. Three such samples contained 1.6, 8.9, and 9.0 per cent. of insoluble matter.

Moisture, generally present, was estimated by spreading in a thin layer on a sheet of glass and drying *in vacuo* over sulphuric acid. Amounts varying from 2.0 to 8.6 per cent. were found, and the dried balsam was usually quite brittle.

The determination of the acid value of the balsam is somewhat difficult owing to the dark color, and to the precipitate which is formed on running in the alcoholic potash. We find it best to proceed as follows:

Dissolve 5 Gm. of the balsam in about 50 Cc. of boiling alcohol, add a large quantity of phenolphthalein solution—3 or 4 Cc.—titrate the hot solution with normal alcoholic potash until the color becomes dark brown (but not red), then attach to reflux condenser, boil up for a few minutes in order to break up the precipitate, and finish the titration.

By this method titrations agree to about 0.2 Cc. $N/1$ KOH.

We append a table of analytical data selected to show the variation from a large number of samples of balsam examined during the last few years.

Excluding numbers 11 and 12, which, from their low content of balsamic acids, we believe to have been sophisticated, the figures indicate a range of—

92.2 to 132.4 for acid value,
59.3 to 90.9 for ester value,
154.8 to 206.7 for saponification value.

and 32.68 per cent. to 47.50 per cent. of total balsamic acids.

The pharmacopœial limits for acid value are from 107.4 to 147.2, and for saponification value 170 to 202.

Judged by these figures numbers 3, 4, 6, 7, 8 and 9 would be rejected for low acid values: also the saponification values of numbers 6, 7, 8, 9 and 13 lie outside the limits, although the poorest of these balsams contain 33.87 per cent. of balsamic acids. On the other hand numbers 11 and 12, though abnormally low in balsamic acids, would be admitted as genuine.

We suggest that the pharmacopœial limits be revised, that an improved method for the determination of the balsamic acids be inserted, and also that limits for ester value be adopted in place of those for saponification value. The differences between the extreme limits for acid value and those for saponification value do not coincide with the limits of the ester value.

The experimental work entailed by the above has been carried out in the laboratories of the British Drug Houses, Limited, under the direction of Mr. C. A. Hill, to whom we are indebted for permission to publish the results.

No.	Acid Value.	Ester Value.	Saponification Value.	Per Cent. Free Benzoic Acid.	Per Cent. Free Cinnamic Acid.	Per Cent. Combined Benzoic Acid.	Per Cent. Combined Cinnamic Acid.	Per Cent. Total Balsamic Acids.
1	111.8	71.2	183	8.55	11.99	6.19	5.93	32.66
2	112.3	79.0	191.3	9.12	11.53	7.87	6.56	35.08
3	98.1	79.1	177.2	8.48	11.86	8.35	8.68	37.37
4	100.6	72.1	172.8	7.8	10.69	7.45	8.92	34.86
5	118.2	60.8	179	9.1	13.7	5.94	8.97	37.71
6	92.2	62.6	154.8	6.63	12.4	6.17	8.67	33.87
7	101.3	65.9	167.2	8.29	13.71	5.37	10.13	37.5
8	102.5	59.3	163.8	8.34	13.54	5.22	9.08	36.18
9	96.6	65.0	161.6	7.86	13.12	6.43	9.95	37.36
10	132.4	66.2	198.6	7.42	15.9	11.1	5.2	39.86
11	140.1	39.4	179.5	—	—	—	—	24.74
12	124.3	58.3	182.6	—	—	—	—	24.4
13	117.8	90.9	208.7	—	—	—	—	47.56
14	108.9	85.3	194.2	—	—	—	—	45.12

ALLEGED POISONING BY POTATOES.[1]

By F. W. Harris, F.I.C., and T. Cockburn, F.I.C.

The shoots, haulms, and leaves of the potato contain appreciable amounts of an alkaloid glucoside, solanine; under certain conditions this alkaloidal glucoside may accumulate in the tubers themselves, and may be present in sprouting potatoes in quantity sufficient to cause serious poisoning.

Numerous cases of poisoning have occurred on the Continent. The symptoms of five epidemics in which 716 individuals were involved are recorded by Dixon Mann.[2] Speaking generally, the symptoms were those of gastro-enteritis—namely, vomiting, diarrhœa, colicky pains, headache, depression, etc. The majority of the cases were serious, although all the people affected ultimately recovered. It is to be noted that the potatoes which acted in this way presented no abnormal appearance.

Pfuhl[3] records the poisoning by potatoes in May and June, 1899, of fifty-six men of the Berlin Garrison. The symptoms were similar to the above, whilst jaundice and partial paralysis were noticed in a few cases. A rise of temperature was generally observed, accompanied by a feeling of irritation of the throat. No dilation of the pupil was noticed. The suspected potatoes, comparatively few of which had sprouted, were large, white, round, and normal in appearance. As mentioned later, the potatoes were examined chemically, and the proportion of solanine found to be much above the normal.

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[1] From *The Analyst*, April, 1918.

[2] Brend, "Handbook of Medical Jurisprudence and Toxicology," p. 252.

[3] *Deutsche medicinische Wochenschrift*, 1899, p. 753.

Mass poisoning by potatoes seems to be comparatively rare in Great Britain. The only case, and that a doubtful one, is reported in Taylor's "Medical Jurisprudence and Toxicology," sixth edition, vol. II, p. 780. The opinion that death (which occurred with two boys who were affected) was due to solanine was based on the fact that in the bowel were found some small pieces of potato peelings which possessed eyes, showing evidence of sprouting. No analysis of the potatoes used appears to have been made.

Towards the end of November, 1917, numerous cases of poisoning occurred in the eastern district of Glasgow; the particulars are shown in the following table, for which we are indebted to Dr. Wright, assistant medical officer of health for Glasgow:

Household.	Number of Persons Ill.	Number who ate Potatoes.	Number who did not eat Potatoes.	Date Eaten.	Onset of Symptoms.	Duration of Illness.
				Nov.—	Nov.—	
A	1	1	7	27, 1 P.M.	27, 2.15 P.M.	Died 31 hours
B.	8	8	None	24, 1 P.M.	24, 2.3 P.M.	Few hours
C	2	2	1	25, 1 P.M.	25, immediately after	" "
D	2 2	3 (1 ate little)	None	26, 5 P.M.	26, 5.30 P.M.	1 to 2 days
E	2	2	1	26, 5 P.M.	26, 8 P.M.	2 hours to 1 day
F	4	4	1	23, 6 P.M.	23, 24, 25, 5	2 to 3 hours to 2 days
G	7	7	None	24, 2 P.M.	24, 3 P.M.	Few hours
H	3	3	1	25, 12.30 P.M.	24, 2 to 3 P.M.	" "
I.	2	2	6	24 and 25, 3 P.M.	25, 5.30 P.M.	" "
J.	6	6	None	23, 1 P.M.	23, 3 P.M.	" "
K	3	—	—	24, 1 P.M.	24, 2 P.M.	" "
L	1	—	—	23	23, soon after	" "
M. . . .	5	—	1	24	24, " "	" "
N	4	—	—	23	23, " "	" "
O	2	4	—	23	23, " "	" "
P	4	—	—	24	24, " "	" "
Q	3	—	2	23	24, " "	" "
R	2	—	—	24	24, " "	" "
Total.	61					

The symptoms in the above epidemic corresponded closely to those exhibited in the Continental cases—namely, headache, vomiting, diarrhœa, and debility—one case, that of a boy of five years, terminating fatally. A post-mortem examination showed that death was due to strangulation of the bowel, a condition which, in the opinion of the medical men who conducted the post mortem, might have been caused by extreme retching and vomiting. The viscera gave no indication of irritant poisoning, and no dilation of the pupil was noticed. Investigation showed conclusively that all the persons affected had partaken of potatoes obtained from one source. In some households those persons who did not partake of the potatoes were unaffected, whilst those who did subsequently became ill. The potatoes were purchased in various branches of a coöperative society in the district, and were part of a consignment of thirteen truck-loads which had been supplied to the shops in question.

A sample of the potatoes which had been in use in the household in which the fatal case occurred was procured, and also samples purporting to belong to the same consignment from the shop. As, previous to the post mortem, it was considered that the cricumstances pointed to an irritant poison, these potatoes were examined for mineral poisons, but with entirely negative results. The stomach contents, viscera, etc., from the fatal case were also shown to be free from mineral poisons on examination.

The potatoes were normal in appearance, firm and solid, but some on being cut into sections possessed a brownish indefinite line near the periphery. On standing for a short time the sections of the potatoes developed a much more decided pink color than other samples similarly treated.

As the buds on quite a number of the potatoes showed evidence of sprouting, being about ¼ inch in length, it was decided to determine the quantity of solanine they contained.

The method of G. Meyer[4] was employed for the isolation of the solanine, and is outlined below

500 Gm. of the pared potatoes were finely divided by means of a grater, and the liquid portion separated by pressing in a muslin cloth, the grater being washed with small quantities of distilled water. After standing for some time the liquid was decanted from the separated starch, which was washed with small quantities of distilled water, the washings being added to the original liquid.

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[4] *Archiv für Exper. Path. und Pharmakol.*, 1895, p. 361.

After making alkaline with ammonia the liquid was evaporated almost to dryness, and the residue boiled with alcohol and filtered. This treatment with alcohol was repeated twice.

The pressed solid portion of the potatoes was also boiled with alcohol in successive portions and filtered.

The united alcoholic solutions were evaporated to small bulk, allowed to stand overnight, filtered from any asparagin which had separated out, and the filter-paper washed with alcohol.

The filtrate was evaporated to dryness and digested overnight, at the ordinary temperature with 250 Cc. of water containing about 3 Cc. concentrated sulphuric acid, in which the solanine is readily soluble. After filtration and washing the insoluble portion with water the solanine was precipitated with excess of ammonia, the solution raised to about 50° C., filtered and washed, and the solanine dissolved by pouring hot alcohol through the paper. The alcoholic solution was received in a weighed crystallizing dish, the alcohol evaporated off, and the solanine weighed after treating with small quantities of ether and drying in the steam oven.

The sample of potatoes from the household in which the fatal case occurred showed the presence of 0.41 part of solanine per 1,000 parts of potatoes, whilst a sample from the store, supposed to be from the same consignment, gave 0.079 part per 1,000 parts. Wintgen[5] gives the normal content of solanine for potatoes in the month of November as 0.0892 and 0.0880 part per 1,000 parts potatoes. These latter results were obtained by a method which differs from that of Meyer in only a few details.

Meyer[6] found in pared, sound, unsprouted potatoes 0.024 part per 1,000, whilst in potatoes which had commenced to sprout, but were still sound, he found 0.040 to 0.066 part per 1,000.

The solanine was identified by the following tests:

(*a*) Its solution in hot amyl alcohol became, on cooling, a solid jelly.[7]

(*b*) Dissolved in a drop of strong sulphuric acid containing a little Frohde's reagent the color changed to, first, light brown, then reddish, and finally a deep violet color.[7]

(*c*) On heating a minute quantity with a solution of telluric acid in moderately strong sulphuric acid (2 water to 1 acid) an intense red color developed.[8]

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[5] *Zeitsch. für Unters. der Nahr. und Genussm.*, 1906, p. 113.

[6] *Archiv für Exper. Path. und Pharmakol.*, 1895, p. 361.

[7] "Poisons," A. W. Blyth, fourth edition, p. 397.

(*d*) On gently heating a small quantity with strong nitric acid a brownish color was at first developed, then became decided red, and passed suddenly into a pale yellow.

In the Berlin epidemic already mentioned Pfuhl states that the potatoes concerned contained solanine as below:[9]

Pared and uncooked	0.38 part per 1,000
Pared and cooked	0.24 part per 1,000

He gives as the normal content for May and June:

Pared and uncooked (May)	0.060 part per 1,000
Pared and uncooked (June)	0.064 part per 1,000

These figures indicate that in both the Berlin and Glasgow cases the potatoes which caused the symptoms of poisoning contained at least five to six times the quantity of solanine which is found in normal, unsprouted potatoes.

An attempt to detect the presence of solanine in a quantity of the bowel contents of the fatal case was unsuccessful, but this is not surprising in view of the failure of Meyer to detect more than traces in the fæces and urine of a dog which had received 0.1 Gm. of solanine for ten days.

The chemical data obtained in conjunction with the statistics compiled by Dr. Wright demonstrate conclusively, in our opinion, that the outbreak of poisoning was due to the eating of potatoes containing an excessively large quantity of solanine, and indicate the necessity for caution in the use of potatoes which have begun to sprout.

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[8] Baur, *Zeitschr. für angew. Chemie*, 1899, 99; *Analyst*, 1899, 24, 152.

[9] *Deutsche medicinische Wochenschrift*, 1899, p. 753.

OITICICA OIL—A NEW DRYING OIL.[1]

By E. Richards Bolton, F.I.C., and Cecil Revis, F.I.C.

During the early part of 1917 we examined a new oilseed sent apparently for the first time from Brazil, bearing the native name of oiticica or oilizika.

The sample consisted of kernels which were oval-shaped and averaged in length from about 2.8 to 4 cm., and in diameter 1 to 2 cm., ten seeds weighing about 35 grms. The kernels readily split into separate portions, much in the same way as do the seeds of *Theobroma cacao,* and, in fact, they closely resemble these seeds in color, being perhaps rather redder in tone, but having a characteristic veining on the outer surface. They have a peculiar and very distinctive smell, which might be described as a heavy and overpowering odor, rather recalling the smell of tung oil, a very interesting property, seeing that the oil, as subsequently described, bears a distinct resemblance to tung oil. There was considerable difficulty in tracing the botanical derivation of these seeds, but it now seems certain that they are the seeds of *Conepia grandifolia,* natural order *Rosaceæ.*

The kernels contain 62 per cent. of an oil, which at normal temperatures is semi-solid, though at higher temperatures the solid portion may be seen to be contained in a medium of liquid oil. The color of the solidified oil is a pale cream-yellow, while the liquid is a bright golden-yellow. The mass solidified with a crenated surface.

The nature of the oil present in the seeds was such that special arrangements had to be made in order to avoid the absorption of oxygen from the air, which takes place exceedingly rapidly as soon as the oil is in a liquid condition. For this reason the drying and storing of the oil were carried out in an atmosphere of carbon dioxide, and special precautions were taken to avoid oxidation during the measuring of the various quantities for analysis. So long as the oil is in the solid state it does not appear to be so sensitive to oxidation.

The following analytical figures were obtained:

Melting-Point.—As the oil consists of a mixture of oils varying from liquids to hard solids, no definite figures can be given to represent the melting-point of the oil, and the points of incipient and complete fusion must both be considered.

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[1] From *The Analyst,* July, 1918.

Incipient fusion	21.5° C.
Complete fusion	65.09° C.

Iodine Value, 179.5.

Saponification Value, 188.6.

Free Fatty Acids as oleic, 5.7 per cent.

Unsaponifiable Matter, 0.91 per cent.

Sp. Gr. at 15.5°/15.5° C., 0.9694.

Refractive Index at 40° C. Zeiss, beyond the scale of the Zeiss butyro-refractometer.

Hexabromide Test.—Only small traces of hexabromides separated when carrying out the test in the ordinary way, but the solution on standing at ordinary temperature for two or three days turned a deep brown color, and precipitated a pale liquid which was not further investigated.

FATTY ACIDS.

Melting-Point	Incipient fusion	53.7° C.
	Complete fusion	67.0° C.
Titer Test		42.8° C.

An attempt was made to separate the liquid fatty acids and obtain their iodine value, but the difficulties involved in attaining the separation of these acids without oxidation proved so great as to render the results unreliable.

In order to obtain some idea as to the value of the oil to the varnish and paint maker, the following experiments were also carried out:

1. *Heat Polymerization Test.*—The oil was heated to a temperature of 250° to 270° C. in an atmosphere of carbon dioxide (in order to avoid oxidation) for thirty minutes, during which time no solidification took place, though a sample of tung oil treated in the same way solidified. It was noticed, however, that during the heating very small bubbles of gas commenced to form as soon as the temperature reached 190° C., but it was not until the temperature reached 280° C. that these bubbles increased to a noticeable extent. Upon reaching 300° C. very large bubbles were evolved, and the

mass set (polymerized). The mass so formed was a *stiff, clear, transparent jelly,* which swelled up indefinitely when mixed with an oil such as linseed or a solvent such as chloroform, and, although no solution apparently took place, the whole mass became gelatinous. It should be noted that the jelly formed by this oil is, as stated above, clear and transparent, while that formed by tung oil under similar conditions is of a distinctly turbid nature. The quantity of oil at our disposal did not allow of any examination of the gas evolved on polymerization.

2. *Oxidation Tests.*—A portion of the oil heated in a thin film at 100° C. for three hours gained in weight 4 per cent. Further heating up to twenty-four hours only showed a total gain of 4.5 per cent. The skin produced in this way is practically insoluble in petroleum spirit, chloroform or acetone. (Tung oil, when treated in the same manner, only increased by 2 to 3 per cent. in weight.) As the oil dries the surface becomes much wrinkled, and there is evidently considerable increase in volume, as is usually the case when such solidification takes place.

A solution of the oil in commercial benzene, when allowed to dry in a thin film on glass, produced a uniform skin, more transparent and continuous in character than is the case with tung oil.

3. *Metallic Driers.*—One or two experiments were tried in this connection, but were not carried out in an exhaustive manner. On the addition of lead acetate to an alcoholic solution of the sodium soaps, a lead compound is formed, as in the case of tung oil, but the substance so produced is of a more granular character than in the case of that oil. These lead compounds are soluble in hot linseed oil when mixed with it in small quantities.

The above experiments all tended to show that this oil has very remarkable properties, which place it in a distinctly unique position, and there seems every reason to suppose that the oil is worthy of the attention of the varnish-maker, and possibly also of those interested in the manufacture of linoleum, but for these purposes it will be necessary to obtain the oil on a commercial scale. Though, as has been pointed out above, special precautions were taken to obtain the oil in an unaltered condition, this was rather for the purpose of obtaining correct analytical figures, and it is quite possible that the oil could be expressed in the ordinary way without serious deterioration, particularly if it were solidified as rapidly as possible after leaving the presses. Even in the liquid condition there is no doubt that a protective film would form on the surface and prevent further change in the bulk.

We desire to express our thanks to Messrs. Booth and Company, London, Limited, and Messrs. J. H. Rayner and Company for the specimens of the seeds upon which our experiments were carried out.

INDIAN BELLADONNA ROOT.[1]

By E. M. Holmes, F.L.S.

For some years past, belladonna root imported from India has replaced the English root in British commerce to some extent, on the ground that the root presented no perceptible difference to the ordinary observer, and that it yielded a somewhat higher alkaloidal percentage. That belladonna root should be imported *in quantity* from India seemed to indicate a new departure, since it is not an article met with in the Indian bazaars, it is not mentioned by Dr. Dymock in his "Materia Medica of Western India," nor in the works of "Mooden Sherff and U. C. Dutt." Dr. (now Sir) George Watt, in his "Dictionary of the Economic Products of India," Vol. 1, p. 352, points out: "It is a remarkable fact that while this most useful plant is exceedingly plentiful in many parts of the western Himalayas, its medicinal virtues seem to have escaped the detection of the natives of India completely. . . . Not a single leaf or root of this most valuable drug can be purchased, of Indian origin, in the native drug shops of the plains. It would therefore appear that the natives of India have been made familiar with the virtues of this plant in the form of an imported drug, while the Himalayas might supply the world with belladonna." But he further remarks that "the leaves of the Indian plant are a little more acuminate in the Himalayan than in the European plant. This is probably what has given origin to *Atropa lutescens* Jacquemont." Dr. Watt has evidently followed the authors of the "Flora of British India," in considering the *Atropa lutescens* of Jacquemont to be a form of *Atropa Belladonna* Linn.

But even supposing that the two plants are identical, there was no evidence in 1889 (the date at which Dr. Watt's remarks were published) that the root of the Himalayan belladonna was met with in Indian commerce. A careful examination of the roots of the Indian belladonna in commerce in this country in 1917 showed me that a large proportion of them differed from the English root in the appearance of the transverse section; whilst in a few samples no such difference could be detected. Under these circumstances, I applied to Colonel Sir D. Prain, the present director of the Royal Gardens at Kew, who resided for some years in India as director of the Botanic Gardens at Calcutta, and inquired if he had any information on the cultivation of belladonna in India; and in reply he kindly gave me the following extracts from the Annual Report of the Kumaun Government Gardens, 1909–10 (p. 3): "Although the plant is said to be exceedingly plentiful in many parts of the western Himalayas, I have been unsuccessful in my endeavors to obtain seed of the Himalayan variety from natives, neither do the large number of hill men I have consulted, including several doctors, know of its existence.

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[1] Reprinted from *The Pharmaceutical Journal and Pharmacist,* August 31, 1918.

"A small supply (2 ounces) of seed was therefore purchased from Messrs. Vilmorin and Andrieux in August last (1909). The seeds germinated satisfactorily, and, as far as I can judge from growth, the plants are all that can be desired.

"Messrs. W. Ransom and Son, of Hitchin, to whom a sample of hill-grown belladonna root was sent last year (1913), reported it to be of very good quality. I have suggested to the commissioner that fifty acres of virgin forest land be devoted entirely to belladonna cultivation. I have sown large quantities of seed in the Chaubattia nursery, and a good harvest of seed is expected during the coming season from the plants in the Kutcherry Gardens, Naini Tal, which were sown from seed originally imported in 1909 from Vilmorin, Andrieux & Cie., Paris (1914–15 Report).

"In the report of the Economic Botanist (C. *and* D., July 14, 1914), it is stated that the sun-dried roots grown in the Kutcherry Gardens gave respectively 0.4 per cent. of alkaloid from one-year-old plants, and 0.45 per cent. from two-year-old plants; whilst belladonna root obtained from Europe, and used in British medicinal preparations, contains from 0.2 to 0.6 per cent. total alkaloids. The roots grown in Naini Tal are therefore of good average quality, and are suitable for use in the medical store departments of India."

In reply to further inquiries made in December, 1917, by the assistant director of Kew Gardens, Mr. Norman Gill, superintendent of the Kumaun Government Gardens, on learning that the Indian belladonna was considered in this country as rather richer in alkaloid than the home-grown product, remarks, in his reply, which I have kindly been permitted to see at Kew: "I am of the opinion that its superior quality, if any, is due more to the climate, altitude, and the nature of the soil than to any particular variety. As far as I can remember our belladonna resembles botanically the specimens I collected in the woods near Painswick, Gloucestershire, in 1908, when at home on leave. I have never come across a wild specimen in this country, and the plant is unknown to the natives of these parts.

"As far as I am aware, we are the first to supply the Indian market with cultivated belladonna. About 1,000 lbs. of the dried leaves and roots were supplied last year to Messrs. Smith, Stanistreet & Co., of Calcutta, who may have shipped them to England. The only other source of belladonna from this country, is, I think, from Kashmir. This finds its way into the Calcutta market, and is evidently collected from wild plants."

There is thus evidence that both cultivated *Atropa Belladonna* root of European origin, and wild root of Himalayan origin, have apparently been exported to England.

I have subsequently learned from Messrs. B. K. Paul & Co., of Calcutta, that "the Indian belladonna roots now in the market are mostly derived from wild sources in the northwestern frontier provinces and Kashmir. The output at present of cultivated Kumaun belladonna is too small, not exceeding 5 cwt. of root and 2 cwt. of leaves a year."

It is clear, therefore, that there are two varieties of belladonna root from India on the London market, but it is not by any means clear which of those two kinds afforded the richer percentage of alkaloid claimed for the Indian root; nor can it be said to be known whether the Indian plant from the Himalayas is only a variety of *Atropa Belladonna,* or a distinct species. I have examined the dried specimens of this plant, which in the National Herbaria at Kew and the British Museum is the *Atropa lutescens* Jacquemont (*A. acuminata* Royle), and am inclined to the opinion that it is quite distinct from the British plant, the leaves being oblong-elliptical, tapering at both ends, and the flowers funnel-shaped, rather than bell-shaped, of a yellow color, and yellow berries. Whilst examining the specimens at Kew Herbarium, Mr. J. R. Drummond, who happened to be there, told me that he had seen the plant growing in the Himalayas, and that no one who has seen the British plant could confound the Himalayan one with it. The color is a paler green, and its habit stiff and erect, the branching being at a more acute angle. It is noticeable also in the dried specimens that the lateral veins of the leaves branch off at a more acute angle. The root also has a distinctly radiate structure, even in the smaller pieces, which is not the case with the British plant.

At all events, it is desirable that experiments should be made at Kumaun on the plant cultivated there, to ascertain whether the average yield of alkaloid is greater in the Indian-grown than in the British plant, also that the *Atropa lutescens* should be examined as to the alkaloids it contains, and the proportion in which they are present. A microscopical examination of the root is already in progress, and if it proves that there is any important difference in the alkaloidal contents of the Indian root, it is hoped that it may be possible to distinguish it even if used in the powdered state; and, if superior, that its value should be recognized. It may be pointed out, in conclusion, that the *Atropa Boetica* of Wilkomm, which occurs in Spain, bears some resemblance in its yellow flowers to those of *A. lutescens,* but the leaves are ovate, rather than elliptical.

PATCHOULI PRODUCTION IN STRAITS SETTLEMENTS.[1]

By Consul George L. Logan.

Patchouli is both a wild and cultivated crop in the Malay Peninsula. The following data concerning it were furnished to the Penang consulate by the Director of Agriculture for the Federated Malay States:

"Patchouli (*Pogostemon patchouli*) is a soft-leaved herb from 2 to 3 feet high, much branched, with square stems, emitting when rubbed the characteristic smell of patchouli. The Chinese, who chiefly cultivate this plant in Malaya, often plant it on newly cleared ground among the fallen logs. Here, slightly shaded, it grows very rapidly and well. Where it is regularly cultivated, it is planted in properly prepared beds.

[1] Commerce Reports, September 14, 1918.

"The best method of propagation is by cuttings of young shoots. These are cut about 3 inches long, care being taken to cut just below a joint. The cuttings are then pricked into nursery beds well watered and shaded. In three weeks to a month they will have rooted and can be removed to the permanent beds, where they should be shaded until thoroughly established. The plant grows well in open sun, but it will also stand a little shade and may be grown as a catch crop in young rubber or coconut clearings. The cuttings may be planted at distances of about 2 feet.

"*Harvesting and Drying—Marseille and New York Chief Buyers.*—The first crop can be cut six months after planting and afterwards twice a year. In Perak it is usual to take only three crops and then replant. The leaves when cut out may be dried in the sun, but it is better to dry them in the shade, spreading them out in a cool and airy shed. When quite dry (about one week) they may be packed in bales.

"One picul (133⅓ pounds) of the leaf dried just as it is cut yields from 24 to 30 ounces of essential oil, and a sample free from the heavier stalks yields about double that amount. Thirty-six pounds of green leaves produce 10 pounds of patchouli. One-twentieth of an acre planted by Curtis gave 449 pounds of green stuff, and after ten days it had dried to 106 pounds, which on picking over gave 69 pounds good leaf and 37 pounds refuse.

"The dried leaf is exported from this country principally to Marseille and New York. Exports from Penang for 1916 were almost exclusively to New York and amounted to about 65 tons."

The export of patchouli leaves from Penang to the United States during 1917 totaled 79,979 pounds, valued at $12,252 gold. Local exporters of native products are in position to handle a much larger volume of trade in this commodity if orders are received.

JAPANESE AGAR-AGAR.[1]

The manufacture of agar-agar is, as a rule, begun towards the close of the year, and is finished at the end of February. It was started some three centuries ago, but still there is no departure from the primitive method of production. Nor is it systematized or developed into a factory industry, although a new company has recently been projected to combine many private and small concerns. Therefore no accurate and up-to-date estimate of its production can be obtained, but it is said that the total value of the annual production is, roughly, 3,000,000,000 yen. In Japan itself only a small portion of the output is used in foodstuffs, the bulk being exported. In 1915 the shipments were 2,202,613 lb., valued at 1,706,064 yen, but in 1916, owing to increased demand and rising prices, the value reached 2,446,862 yen, while the volume stood at 2,785,710 lb. Last year the shipments fell to 2,102,629 lb. and the value to 1,954,983 yen. Before the war China and Germany were the largest buyers, but since the war the United Kingdom, Russia, and China have been the largest buyers; now the United States hold the first position. As to the after-war prospects, the Japanese Government issued a hopeful statement some time ago in one of its reports, but much doubt is entertained respecting this year's trade.

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[1] From *The Chemist and Druggist,* June 8, 1918.

THE PHARMACY DEPARTMENT OF THE AUSTRALIAN ARMY MEDICAL CORPS.[1]

The Australian Pharmacy Department of the A. M. C. (writes Mr. G. E. Gibbard, editor of the *Canadian Pharmaceutical Journal*) is the first independent pharmacy department organized in any army of any state in the British Empire, or even any Anglo-Saxon country, and although in operation barely two years, has "made good" so effectively that its influence is expected to produce a reform in the armies of the entire empire.

The organization is simple and effective, including in its operations both the home and overseas forces.

The members of the pharmacy corps are exclusively qualified pharmacists, enlisted under conditions similar to those which prevail with the other units of the A. M. C., physicians, dentists and veterinaries. The officers are:

Senior major, who ranks as staff officer of pharmacy service on the staff of the director-general of the A. M. C. This position is now held by Major Cossar, who was first appointed Hon. Captain, promoted to Hon. Major, and again to full ranking major.

Next in rank is captain. The chief senior pharmacy officer of each state.

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[1] Reprinted from *The Australasian Journal of Pharmacy*, July 20, 1918.

Lieutenants are qualified pharmacists, head dispensers in general hospitals, base hospitals, and forward casualty stations.

Staff-sergeant is the lowest rank of any member of the unit, and is held by all assistant dispensers, and men in charge of medical stores.

Senior major, the officer commanding, is responsible for all medical supplies and through him all recommendations for purchases must be made.

Captain, as chief senior officer of the state, has charge and supervision of all medical stores and supplies for his state.

Lieutenant has charge of medical supplies of hospitals, casualty stations and is chief dispenser for such institutions.

Staff-sergeant is assistant dispenser under command of the lieutenant and A. M. C. quartermaster.

All officers in the pharmacy department must be regularly qualified pharmacists, and draw pay according to rank, as in all other units.

In addition to the above outline, the department manufactures all galenicals required for the service, such as tinctures, elixirs, ointments, liquors, etc. As non-taxed alcohol is used, the saving to the government is very considerable.

CORRESPONDENCE.

SOME REASONS WHY EVERY RETAIL MERCHANT SHOULD KEEP BOOK ACCOUNTS.

Attached is a general letter addressed to retail merchants by the Commissioner of Internal Revenue pointing out the necessity for keeping accounts. Your assistance in the distribution of this letter through the medium of your publication or by duplicating it and mailing copies to your members or customers will be appreciated.

To Retail Merchants:

The Revenue Act now pending in Congress is expected to produce $8,000,000,000. This means a tax on the average of more than $76 for every man, woman and child in America. The average per family is nearly $340.

In many businesses taxes will be one of the largest items of expense. It is of the utmost importance, therefore, that every concern in business, large or small, whether corporation, partnership or individual, shall maintain an exact record of its receipts and expenses—in other words, keep accurate accounts. Taxes should be considered as an expense of the year for which they are assessed rather than for the year in which they are actually paid and the necessary reserves should be provided for at once.

Because of the large amounts to be collected, the Bureau of Internal Revenue will be compelled to check the income tax returns filed by taxpayers more closely than heretofore. The retail merchant who is able to place before the Internal Revenue Inspector book records showing exactly how he arrived at his statement of net income will greatly facilitate the government's task of collecting the war revenues and save himself annoyance and expense.

No special system of accounts is prescribed by the Internal Revenue Bureau but the books should show in detail inventories, purchases, sales, capital investments, depreciation, and similar items required in making up the income tax return. Every merchant should study the income tax law and regulations and see to it that his accounts are kept in a manner that will enable him to determine his net income for taxation purposes.

Aside from the necessity of keeping systematic accounts in order to comply with the government's requirements, every progressive merchant should adopt an approved accounting system for the good of his own business. In no other way can he further his financial interests more effectively. It has been proven time and time again that accurate accounts are absolutely essential to success in business. The merchant who has a good accounting system is able to eliminate waste and unnecessary expense and can so control his purchases and his credits as to greatly lessen the chance of failure. The inventory, which cannot be taken without some form of accounts, is the compass of a business. Without it the direction in which the business is heading either for success or failure cannot be determined.

In the complexities of modern business costs must be calculated with certainty in order to determine what the selling price of an article should be in order to yield a reasonable profit. This is impossible without books of account.

The profits of a business or the losses of a business cannot be determined without book records; and now that the nation requires every citizen to contribute to the war budget within his means and income, the returns required by the government under the revenue laws cannot be made with any degree of accuracy without books of account and annual inventories.

The bad-debt loss of the nation, which runs into large figures annually, is due in large measure to inexperience and inability. If merchants would keep even the simplest books of account the bad debt wastage would be reduced materially, for inability and inexperience are usually marked by the absence of an accounting system.

Owing to the withdrawal of man power from industry it is essential that every business man be more frugal and exert himself more effectively to conduct his business efficiently. Extra effort put forth in carrying on the business so as to increase volume at less expense, will decrease the chance of failure, increase the earnings of the merchant as a reward for his effort, and enable him to share more liberally in the governmental financial program made necessary for the successful prosecution of the war.

The man who knows the exact condition of his business from day to day has an immeasurable advantage over the individual who has no records upon which to base his operations. It is the duty of every citizen especially in these war times to keep in such close touch with his business through record keeping and otherwise as to maintain the greatest efficiency and render to his government every cent due in taxes.

Daniel C. Roper,
Commissioner of Internal Revenue.

PROFESSORS COOK AND LAWALL SUCCEEDING EDITORS OF REMINGTON'S "PRACTICE OF PHARMACY."

Mr. Geo. M. Beringer,
American Journal of Pharmacy,
145 N. 10th Street,
Philadelphia, Pa.

Dear Sir: We enclose an important note regarding the editorial staff of Remington's "Practice of Pharmacy." The appointment of Prof. E. Fullerton Cook and Prof. Chas. H. LaWall, to continue Prof. Remington's great work will, without doubt, be of great interest to your readers, a large number of whom look to his "Practice of Pharmacy" as the standard work of reference and reliability in its field. They will recognize in these appointments, which were made by Prof. Remington himself some time before his death, a guarantee of the permanent high standing of this invaluable work.

We hope it will be possible for you to make use of this note on your editorial page, in this or a similar form, as a matter of general interest and importance. With appreciation of any use you may make of it, we are, Very truly yours,

J. B. Lippincott Company,
Advt. Dept.

The sixth edition of this standard treatise on pharmacy appeared only a few months before the death of its famous author and it stands as one of the crowning achievements of that remarkable life. Urged several years ago to relinquish some of his many activities, he yet felt that duty required him to maintain a guiding hand until the new editions of the United States Pharmacopœia, "Practice of Pharmacy," and the Dispensatory were completed—but then the strong will collapsed and in a few months the pharmaceutical world mourned the death of this great leader.

However, with Professor Remington's foresight and attention to details, he had anticipated the inevitable and long planned his succession in the work which was his chief delight, his text book on pharmacy. This was foreseen by many, since for years he has been training and coaching his assistants, and trying out their qualifications on successive editions, until, when sickness compelled him to drop many phases of the work, they were able to carry it to completion.

It is therefore, no surprise to learn that the future of Remington's Practice of Pharmacy will be ably taken care of by E. Fullerton Cook, and Charles H. LaWall, both of whom are already well known in pharmacy and whose selection will insure the continuance of the same high standard and at the same time, the practical character of this famous pharmaceutical guide.

THE PENNSYLVANIA BOARD OF PHARMACY.

Notice of Examinations.

Harrisburg, Pa., Sept. 10th, 1918.

Examinations for applicants desiring registration as Pharmacist or Qualified Assistant Pharmacist, will be conducted in the

Philadelphia College of Pharmacy, 145 N. Tenth Street, Philadelphia, and the Pittsburgh College of Pharmacy, Corner Pride and Bluff Streets, Pittsburgh, on Friday and Saturday, November 8 and 9, 1918.

TIME AND PLACE.

PHARMACIST EXAMINATION.

Practical Pharmacy—Friday, November 8, 1918.

Class No. 1, at 9:00 o'clock.

Class No. 2, at 11:30 o'clock.

Pharmacy—Friday afternoon, November 8, 1918, 1 to 6 o'clock.

Materia Medica—Saturday morning, November 9, 1918, 9 to 12 o'clock.

Chemistry—Saturday afternoon, November 9, 1918, 2 to 6 o'clock.

ASSISTANT PHARMACIST EXAMINATION—At the Pittsburgh College of Pharmacy, Corner Pride and Bluff Streets, Pittsburgh, Pa., and the Philadelphia College of Pharmacy, 145 N. Tenth Street, Philadelphia, Pa., on Saturday afternoon, November 9, 1918, at 1:00 o'clock.

L. L. WALTON, *Secretary,*
P. O. Box No. 265, Williamsport, Pa.

The following are the sixth and seventh, respectively, of the students or graduates of The Philadelphia College of Pharmacy known at this time to have made the "supreme sacrifice" in the great war.

George Herbert Brenner, a native of York, Pa., a member of the P.D. Class of 1917, and president of the class in its freshman year, was one of the first P.C.P. students to enter the service of the country. He attended the Officers' Training School at Fort Niagara and won the rank of first lieutenant. He became a member of the Aviation Section Signal Corps, and lost his life, August 25, when his machine fell in northern Italy.

William Henry Fitzsimmons, aged 26, a native of Kane, Pa., was graduated with the class of 1914. For some time he was employed by the Kane Drug Company, and then became a part owner of the business by buying the interest of E. H. Watkins, '89. Last spring he enlisted in the Navy and was sent to the Great Lakes Training Station near Chicago. He died the latter part of September of pneumonia, following an attack of influenza.

BOOK REVIEWS.

A Laboratory Manual of Qualitative Chemical Analysis. By A. R. Bliss, Jr., M.D. Ph.G., Professor of Pharmacology, School of Medicine, Emery University, Atlanta, Ga.; formerly Professor of Chemistry and Pharmacology, Graduate School of Medicine, University of Alabama. Second Edition, Revised and Reset. 194 pages with working tables. Philadelphia and London, W. B. Saunders Co., 1918. Cloth, $2.25 net.

The present book, designed "for the use of students of medicine, dentistry, pharmacy and science" is the result of a thorough revision of the first edition, in the process of which revision changes, deletions and additions were made.

The subject matter is divided into three parts: Part I, dealing with "The Metals or Cations"; Part II, with "The Acids or Anions"; and Part III, with the analysis of unknowns, metals and alloys.

The first chapter of Part I, covering 40 pages, (1) gives a list of the apparatus and reagents needed to carry out the work outlined in the book, together with directions for preparing the reagents, (2) explains the function of chemical analysis, (3) gives a concise outline of the theories involved in analysis, (4) explains solution, osmotic pressure, ionization, neutralization, electrolytic and hydrolytic dissociation, mass action, etc., and the effects these have in reactions, and (5) closes with a group classification of the common metals, bases or cations. Of the remaining fourteen chapters, each of those of even number takes up a group of metals and discusses each metal as to its symbol, atomic weight, valence and most distinctive physical properties, together with tests for the identification of its ions; while each of the odd-numbered chapters treats of the separation of the ions of a group.

In Part II the anions are considered in three groups: Group A, "Precipitated from neutral solution by Barium Chloride"; Group B, "Precipitated from diluted Nitric Acid solution by Silver Nitrate"; Group C, "Not precipitated by Barium Chloride or Silver Nitrate." Three chapters are devoted to tests for the identification of many common anions, and a fourth chapter takes up the systematic examination of unknowns for anions.

Part III treats of the examination of unknowns for both cations and anions, and of the qualitative analysis of alloys. A two-page "Solubility Table," giving the relative solubilities in water and acids of the compounds of 25 anions with 29 cations, should be of material assistance to the student in identifying any given one of a large number of unknowns.

The language used in the book is concise and clear, the print is clean and sufficiently bold to permit of easy reading when the book is used on the laboratory table, and, all in all, the manual appears to be well adapted to fulfil its intended mission,—that of teaching students how to identify the majority of the substances with which they have to deal in their every-day practice.

F. P. Stroup.

A Critical Revision of the Genus Eucalyptus. By J. H. Maiden, I.S.O., F.R.S., F.L.S., Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney. Vol. IV, Part 4, Part XXXIV of the complete work.

The part of this critical monograph on the Genus Eucalyptus now at hand describes the following species—Eucalyptus redunca Schauer, E. accedens W. V. Fitzgerald, E. cornuta Labill, E. Websteriana Maiden.

The method of presenting the subjects is in conformity with that adopted in the preceding published parts of this classic study and adds descriptions, ranges, affinities, and varieties and uses of the four species described. The plates illustrating these species are excellent and are high-class illustrations of the lithographers art in depicting botanical characteristics.

G. M. B.

OBITUARY.

JOHN A. DUNN.

Mr. Dunn was born in 1840 in St. Louis, Mo., and, from his early boyhood, was the constant companion of his dear friend, Dr. William F. Edgar, of Los Angeles, Cal. Dr. Edgar was U. S. Army Surgeon and before the Civil War was with the U. S. Government Scientific Survey. The deceased, then a boy, traveled with the expedition that was detailed to run the 35th parallel through New Mexico and to establish a U. S. Army Post at Albuquerque. These were the first white people who had ever penetrated that country. It was during this expedition that scientists first observed the land of the Cliff Dwellers and claimed that the peculiar formation was due to volcanic disturbance, while the men in the command looked on and argued "these things were made by human hands," which we all know was proven later. Wonderful and numerous were the tales this interesting old gentleman related of the primitive American Indian. As he always added, "Still untainted by the inroads of civilization."

It was during this expedition that the government imported camels to accompany the command across the American desert. The journey was hard and strange and the men impatient and often ugly and Mr. Dunn has often told how much he was impressed when early one Sunday morning they espied the green country beyond the Sierras and the great Pacific in the distance. Not one word was spoken but every man fell upon his knees and prayed his thanks to the One who had safely brought them out of that alkali waste. They went on to California and were stationed at the Presidio and for a time at San Diego.

When the Civil War broke out Mr. Dunn came to New York with the troops and was in the government employ as an apothecary. In 1866 he entered the employ of E. R. Squibb and Sons, manufacturing chemists, as superintendent and as such held sway until in the latter nineties he became one of the firm. He was an expert and an authority and was many times referred to as the brain and pulse of E. R. Squibb and Sons. About ten years ago his eyesight failed, but he did not give up active work until five or six years ago. He was up and around as usual the day before he died. He was smitten with a stroke on Thursday night from the effects of which he passed away Friday morning, August 30.

The deceased was a graduate of the New York College of Pharmacy, an alumnus of same, was also a member of American Pharmaceutical Association, and generally attended the conventions, taking an active interest in the proceedings and a part in discussions, imparting much information from his well-stored mind. The Richmond meeting was the last annual meeting that he attended, in 1910. He was buried in the Cemetery of Holy Cross, Flatbush, on Monday, September 2. He leaves a widow, Annie E., and a daughter, Mrs. J. O. Reither, of Lynbrook, Long Island.

GEORGE DEMING TIMMONS.

In the demise of Prof. George D. Timmons, dean of the Valparaiso College of Pharmacy on July 18, the American Pharmaceutical Association has lost another of its valuable members and an exemplary figure in American pharmacy has passed away. Prof. Timmons was born in Warren County, Ind., on August 10, 1867, and was educated in the schools of his native state. For about ten years he taught in the public schools and thus laid the foundation by practical experience for later successful work as a teacher and dean of the Department of Pharmacy of the Valparaiso University.

Mr. Timmons was graduated from the Valparaiso College of Pharmacy in 1897 and very soon thereafter was appointed an assistant to the professor of chemistry and pharmacy and in 1907 was made the professor in charge of this branch and in 1912 was elected as dean of the Department of Pharmacy. He also attended the University of Chicago for post-graduate studies.

He was an enthusiastic worker and as an author of several works on chemistry gave promise of much more useful labor in behalf of his chosen calling. He possessed the ability to impart his enthusiasm to his students and colaborers and to this is attributed the success that attended his efforts in behalf of his alma mater. His interest in the public affairs of the city and community in which he dwelt was keen and he served four terms as a member of the City Council of Valparaiso.

At the time of his decease he was engaged with Mess Eli Lilly Co. of Indianapolis. He was stricken with typhoid fever and after a short illness died of this malady in the Methodist Hospital in Indianapolis.

THE AMERICAN
JOURNAL OF PHARMACY

NOVEMBER, 1918

EDITORIAL.

A QUASI RECOGNITION OF PHARMACY.

In the "Correspondence" in this number appears a communication from Dr. A. R. L. Dohme, the retiring president of the American Pharmaceutical Association. This is a sincere effort to secure recognition by the War Department of pharmacy as an essential industry so that the required number of registered pharmacists and of assistants necessary to provide for the nation's needs for medical supplies, may be given a deferred draft classification if they can show that their retention in the positions that they are filling is "necessary to the enterprise in which they are engaged."

That there is at present a lack of a sufficient number of apothecaries and of competent assistants to attend the actual needs for such in many communities, was most emphatically demonstrated during the recent epidemic of influenza. The widespread demand for additional pharmaceutical assistance was such a practical exhibition of the dependence of the people upon the druggists and the importance of the practice of pharmacy to the welfare of the nation, that there should be left no room for doubt in the minds of the military authorities as to the necessity for the recognition of pharmacy as "an industry essential to the maintenance of national interest."

The AMERICAN JOURNAL OF PHARMACY is pleased to devote the space to this communication and unhesitatingly to support this proposition which is based on undeniable facts and logical reasoning, and merits the endorsement of every thoughtful citizen.

The columns of this JOURNAL have always been open to all communications in the interest of pharmacy or the public good. As the oldest and foremost American journalistic advocate of the ethical practice of pharmacy, it has consistently for ninety years supported every proposition looking toward the elevation of the profession of pharmacy and the conscientious merchandizing of drugs. It has never even suggested that the views of its contributors should coincide with the opinions of the editor. So well has its position been established that the foremost research workers in pharmacy and allied scientific pursuits and the recognized leaders in pharmaceutic matters have appreciated that it was the proper medium for recording their work and communicating to their fellow pharmacists the principles advocated.

The campaign of education that has been carried on for the recognition of a real pharmaceutical service in the United States Army has compelled the military authorities to give some consideration to this proposition. As the continual attrition of the trickling drops of water wears away the adamantine rock, so the continuance of the common sense arguments is gradually telling upon the bedrock jealousy and prejudice that has heretofore prevented the establishment of an organized pharmaceutical corps as an efficient branch of the U. S. Army Medical Service.

As the world war progressed evidence has not been lacking that the pharmaceutical service in the Army was inadequate and unsatisfactory, and that the education and training of the medical officers left out much that was essential to the proper purveying of army medical supplies. To overcome in part the latter deficiency, a few pharmaceutically trained men were commissioned as "supply officers," and Surgeon-General Gorgas authorized a "make shift"—the education of a number of men from the ranks for the supply and accounting service. Several training schools for the medical supply service were organized and men who, as a rule, had no knowledge whatever of drugs and medical supplies were detailed for a course of training to fit them in the shortest time possible for the accounting, storing and distribution of the army medical supplies, and commissions were authorized for some of these, who were thus performing only a portion of the duties that should properly be assigned to members of an organized pharmaceutical service.

A further indication of the awakening of interest in the War Department is shown in the possibility of utilizing schools of pharmacy and pharmacy students for the organization of units of the Students' Army Training Corps. In this connection the following circular letter has been issued:

(ADVANCE COPY)

WAR DEPARTMENT

COMMITTEE ON EDUCATION AND SPECIAL TRAINING

Special Bulletin on Program in Pharmacy

The program here presented is not prescribed, but is an example of what will be approved. It is intended to indicate how existing programs may be modified by eliminations and condensations so as to meet the needs of the present emergency. The program covers eight terms of twelve weeks, but it must not be inferred that every student entering on such a course will be kept at college until he completes it. The time that he will be permitted to pursue the course will depend on the needs of the service and the academic record of the student. In addition to the instruction indicated in the program, eleven hours per week of military instruction are prescribed for the first three terms of the program, and six hours per week for the remainder of the program. The total time to be devoted to military and academic instruction, including examinations, lectures, recitations, laboratory work and supervised study, is 53 hours per week. The hours set forth in the program represent the total time devoted each week to the subjects named. The relation of the time given to study to that assigned to lectures, recitations and laboratory work varies considerably with the nature of the subject, but on the average the former is not more than half of the total time allotted. The subject, War Issues, which must be combined with English Composition is, with the exceptions indicated in Section 26 of the Regulations of the S. A. T. C., prescribed for three terms with nine hours per week for lectures, recitations and study.

First Term.

	Hours per Week.
Chemistry	12
Pharmacy	9
Botany	6
Physiology and Hygiene	6
War aims and English Composition	9

SECOND TERM.

	Hours per Week.
Chemistry	12
Pharmacy	9
Pharmacognosy	6
Physiology and Hygiene	6
War aims and English Composition	9

THIRD TERM.

Chemistry	12
Pharmacy	9
Pharmacognosy	6
Pharmacology and Posology	6
War aims and English Composition	9

FOURTH TERM.

Chemistry	15
Pharmacy	15
Pharmacology and Posology	5
Bacteriology	12

FIFTH TERM.

Chemistry	15
Pharmacy and Dispensing	15
Bacteriology	12
Pharmacology and Posology	5

SIXTH TERM.

Chemistry	15
Pharmacy and Dispensing	24
Preparation of Diagnostic Reagents	5
First Aid	3

SEVENTH TERM.

Chemistry	15
Pharmacy and Dispensing	15
Pharmacopœial Assay	12
Urinalysis	5

EIGHTH TERM.

Chemistry	15
Pharmacy and Dispensing	23
Applied Microscopy	9

COMMITTEE ON EDUCATION AND SPECIAL TRAINING,
By R. C. MACLAURIN,
Educational Director, Collegiate Section.

October 1, 1918.

This announcement is the outcome of a conference held in Washington on Sunday, September 29, between Dr. Maclaurin, whose signature is attached to the letter, and seven representatives of university schools of pharmacy. While heralded in some quarters as a great achievement and as a real recognition of pharmacy and possibly the forerunner of the establishment of a pharmaceutical corps in the U. S. Army, a more deliberate judgment will demonstrate that it is only a quasi recognition and not such an actual recognition of modern educated pharmacists as that accorded, by virtue of congressional enactments, to the other divisions of medicine represented in the Army Medical Department and certainly not comparable with the fair recognition of pharmacy for which representative pharmacists have been contending in their plea for a pharmaceutical corps.

The history of that Sunday conference, so far as made public, leaves much to be explained and more to be surmised and commented upon. No explanation has as yet been made as to the preliminary conferences and as to the responsibility for the suggestions to the Committee on Education and Special Training as to which schools of pharmacy should be invited to the conference and to participate in the proposed pharmacy units of the Students' Army Training Corps. It is, however, possible that there may have been some connection between this movement and certain meetings of some of the members of the faculties of the university schools, the details of which have not been placed before their associates in the American Conference of Pharmaceutical Faculties.

There is no denying the fact that there has been a deliberate shaping of this movement in such a manner as to be favorable to the interests of those schools of pharmacy who are allied to universities and to discriminate against those schools who have so far kept aloof from such affiliation. This is but another evidence of that factional spirit that has been so energetically developed in the conference named and which if persisted in may result in making that body a "dissociated association."

It is foreign to the purpose of the writer to reflect in the least upon the standing of any school of pharmacy that has been admitted to membership in the American Conference of Pharmaceutical Faculties or that has been selected as a training school for the S. A. T. C. As these events, however, are of national interest and of vital importance to American pharmacy, they are properly the subject for frank criticism. The facts at hand show that the opportunity to perform a master stroke in the interest of PHARMACY in a broad fraternal and professional spirit has been diverted by narrow-mindedness and schism to serve as a factional advantage. The professional ideals, so generously proclaimed, gave way to the tactics of the politician and we have here another example of that "too much self-interest and jealousmindedness among pharmaceutical associations" that Dr. Dohme criticised at Chicago.

It is indisputable that some of the most prominent schools of pharmacy, with established records for their high attainments, were deliberately ignored. The fact that in these the facilities, equipment, faculties and student bodies were superior and that their curricula already included the scientific subjects and higher pharmacy that was incorporated in this "Special Bulletin on Program in Pharmacy" received no consideration. We are unwilling to believe that the members of the committee were ignorant of these facts and so we are forced to the conclusion that other motives directed the misadvice to a department of the government at a critical period in the history of the nation. The misadvice and misdirection of a national movement, for a temporary factional advantage, cannot be construed as to the best interests of the nation or of pharmacy.

The principle of the "golden rule" was cast aside and the biblical injunction "by their fruits ye shall know them" as well as the slogan of modern business, "deliver the goods," were swept aside by the perverse wind of jealousy that once again presented pharmacy with a divided front.

The circular "press notice" issued on this Sunday conference was addressed "To the Pharmaceutical Profession of America." Just who are to be considered as constituting the "pharmaceutical profession of America" is a question that is reserved for further discussion. The bias that has affected the moral vision and judgment of some pharmacists was further shown by the fact that the AMERICAN JOURNAL OF PHARMACY was not favored with a copy of this notice, even after the author's attention was directed to this omission. Our imagination is not so elastic that we can conceive a lack of acquaintance with this journalistic advocate of pharmacy and likewise the editor's interest in the matters at stake, including the establishment of a pharmaceutical corps in the United States Army.

G. M. B.

PAPER ECONOMY

The Paper Economy Section of the War Industries Board has requested that retail merchants coöperate with the board in their program advocating economy in wrapping paper. With that end in view the week of November 11 to 16 was designated by the board as Paper Economy Display Week. The merchants are requested to cease the wrapping of trade packages and to encourage the use of the market basket so as to save wrapping paper and twine.

There is probably no other vocation where the niceties of the business call for the careful wrapping of every package, and such has been the prevailing custom in our best pharmacies. There are many reasons why prescriptions and packages of medicine, especially those containing toxic ingredients, should be carefully wrapped. On the other hand, there is no question but that the drug trade has carried this custom to extreme, and that there has been considerable wastage of paper from the wrapping of packages and rewrapping of bundles.

The present stringency in the paper market and the high price commanded by all grades of paper should lead the druggist to adopt methods of economy in his paper usage. There are many bundles that come to him from the wholesalers and manufacturers the outer wrapping paper and string of which can be preserved and utilized again in the wrapping of his parcels, and the aggregate saving from this simple matter of economy if adopted by the drug trade would mean the saving of many tons of paper pulp during the year. Let each druggist give thought to economy in the essentials of his business, including such minor items as paper, string and corks.

G. M. B.

WHAT OF THE EDMONDS BILL?

By E. Fullerton Cook, Ph.M.,
Secretary National Pharmaceutical Service Association.

War preparations and achievements are marshalled before us day by day on a scale beyond the comprehension of any individual citizen of these United States. There is no activity of pre-war days which is not mightily effected by this concentration of national energy, assembled for the sole purpose of smashing the "intolerable thing" which threatened to engulf the world.

In planning to use our national power to the uttermost, some activities have been classed as non-essential and have quietly stepped aside for the war; others were at once recognized as a vital part of our defense, and have been intensified and utilized to a tremendous degree, while still others were classified as "essential to a limited extent" and, while not eliminated, were given little encouragement or protection.

To the surprise and chagrin of many pharmacists who know the large place accorded pharmacy in the economic life of the nation, and who believe that it may justly claim an honorable place in accepted modern methods for the prevention and treatment of disease, pharmacy was practically classed by the army officials as belonging to the "limited essentials," and this is the position yet maintained by the office of the Surgeon-General of the Army, notwithstanding an avalanche of protest from every part of the United States and even though what are believed to be unanswerable arguments have been laid before the Surgeon-General of the Army and the Military Affairs Committee of Congress. This is also in the face of proofs and demonstration to the contrary given by the French, Italian, Australian, Japanese and German military establishments, and by the pharmacists in our own incomparable marines and Navy.

These are the facts that must be faced, and though seemingly discouraging, there are many reasons for keeping faith in the future. Pharmacy itself has been partly to blame for the situation; there should have been years of education and organization back of the proposed pharmaceutical corps; the army started the war with a discredited and inferior pharmaceutical organization and a splendidly planned medical corps. Many of the fields of activity belonging properly to a pharmaceutical corps, in accordance with European precedent, had already been provided for in the medical organization. Is it surprising that there was opposition to a reorganization of so important a department in the midst of the most gigantic war of all history? Take, for instance, the medical supply division, with its millions of dollars worth of purchases and enormous distribution problems. Here medical officers were already in charge and were wise enough to call in the best pharmaceutical help of the country, when the task proved beyond them, but they were not ready to turn it all over to a yet to be established organization.

Evidently, the pressure from a nation-wide demand for safe dispensing in the army has had some effect. A committee of pharmacists were told a few weeks ago in Washington that qualified and trained pharmacists were now in charge of all important army dispensaries, although it was impossible and unnecessary to make such provision for smaller units.

Notwithstanding this assurance, letters continued to come to the secretary's office, describing inefficiency in the dispensing of medicines, poor stocks, and wholly unsatisfactory pharmaceutical conditions. The acknowledgment, however, that the services of a trained pharmacist are important, at least in the larger divisions of the army, is of itself a big advance. In the medical supply division, a number of pharmacists have been gradually assimilated and given recognition; in some instances, lieutenancies having been secured. In the Sanitary Corps, which is largely covering a line of work which a pharmaceutical corps should embrace, trained pharmacists are finding a place, to a limited extent, and winning recognition. The facts, therefore, are that the pharmaceutical profession is gradually being assimilated into the medical corps on a basis quite identical with that proposed in the Edmonds Bill, and this is itself sufficient evidence to prove that the principles and claims of the pharmaceutical profession, as expressed in the Edmonds Bill, are just and true.

As a result of careful development, the United States Navy and the Marine Corps have developed a division of their medical department which closely resembles the plan for a pharmaceutical corps in the Army, for which we have been struggling. This organization is of itself convincing proof that physicians in military organizations can use advantageously this important adjunct to the medical and sanitary division of the army. Why, therefore, have the efforts for recognition up to this time been a failure? There are those who would believe that unworthy motives have actuated the heads of the medical department of the Army in refusing officially to recognize the claims of pharmacy, but we believe it is largely because of misunderstanding. We must, in loyalty to the Nation, give unqualified support to those who have proven so conclusively their desire to place the machinery for maintaining the health and physical welfare of the defenders of liberty upon the firmest foundation of modern medical science, and believe that they have conscientiously opposed this modification of the medical corps of the American Army. We must acknowledge, too, that in the pharmacists' desire to serve the country effectively, they have, perhaps, failed at times to recognize the methods essential to the control of a military organization, and have tried too precipitously to force themselves upon the Army, but now enough time has passed to gain a perspective for both medicine and pharmacy and to obtain experience with the old American method and the plan of the modern European armies, and the time is near at hand, it would seem, when a conference could adjust the present differences, and establish a model department in which pharmaceutical claims would find adequate recognition and yet be in complete harmony with the most effective development of the medical corps.

The war is providing an opportunity for the establishment of professional pharmacy in accordance with the ideals and desires of many in the profession. Leaders in pharmacy and pharmaceutical colleges have been developing a new pharmacy in the last few years. The filling of prescriptions becoming less frequent in many localities, drug stores have been compelled, for financial reasons, to largely commercialize their business and become merchants. This phase of pharmacy has swept the country and has been accepted by the medical department of the Army as the sole representation of modern American pharmacy. That the pharmacist, however, should be an efficient aid to the physician in every phase of his practice, as was the pharmacist of fifty years ago, it has been necessary for an extensive development of the scientific work of the pharmacist, and of the character of his equipment. It is true that there are only a limited number who have established professional pharmacy on lines as broad as here indicated, but there are many who have secured the necessary training to qualify them for these modern professional requirements of pharmacy. These conditions should of themselves give to the medical department of the Army an added incentive for the establishment of a pharmaceutical corps. Thousands of physicians will be trained in the Army to depend upon laboratory methods of diagnosis, and upon the use of bacterial vaccines, sterile products, intravenous methods of treatment, etc., and when these men return to civil practice, they will need skilled medical aid of the type just described in their daily practice.

By the establishment of a pharmaceutical corps of the kind which professional pharmacy desires, and is anxious to coöperate in the establishment of, a large group of pharmacists would be trained for this kind of aid to the medical profession, when the war is over. Will the medical department of the Army see this wonderful opportunity and assist in establishing professional pharmacies throughout the country, manned by pharmacists highly trained in the technical subjects of the profession, such as bacteriology, clinical chemistry, the highest type of dispensing, etc., and thereby make possible the establishment in this country of the pharmaceutical ideals long urged by the leaders of pharmacy.

AN OPEN LETTER FROM A PHARMACIST IN ACTIVE SERVICE WITH THE AMERICAN EXPEDITIONARY FORCE.

To the Pharmacists of America and their Friends:

It has come to my notice from a number of publications, notably an August edition of the *Los Angeles Examiner,* that petitions are being signed and circulated urging Congress to pass the Edmonds' Bill, which provides for commissions for the pharmacists in the army of the United States.

Being a pharmacist, I fully appreciate the necessity and fairness of this proposed legislation.

I am Chief Pharmacist of the Base Hospital Number Thirty, American Expeditionary Forces. The normal capacity of our unit is four thousand (4,000) beds, and it is not only necessary for me to dispense prescriptions for these patients, but for the officers, nurses, soldiers and civilian employees of the hospital personnel.

It is a very responsible position, one that requires a man of thorough training. Hundreds of delicate and intricate prescriptions are filled daily for the sick and wounded, and the lives of these patients depend upon the thoroughness with which the pharmacists do their work. It is true that the doctors prescribe certain medicines and compounds for their patients, but it is the pharmacists' duty to accurately and carefully prepare the compounds which are to cure those suffering from various kinds of illness and wounds.

Before enlisting in the army, I had more than fifteen (15) years of training, and at present am the proprietor of two of the leading pharmacies in California. In civil life, the men of my profession who are now in the army were employed at high salaries and did responsible work. The governments of our Allies, as well as the governments of Russia and Germany, have commissioned the pharmacists in their armies and navies. The pharmacists in the navy of the United States are commissioned officers, therefore it seems only fair that the pharmacists in the army should be commissioned.

Being only enlisted men, it is possible for pharmacists to associate with no one but the enlisted men of the army, and they are not permitted to mingle with medical officers, nor to discuss with them subjects which are of vital importance to both, and which would tend to a higher standard of efficiency in this branch of the service.

It seems to me both unnatural and unjust that the pharmacist, whose work in both civil life and in the army is equally as important as that of the medical officer, veterinarian and dentist, should be of so much lower rank than they, that it is impossible for him to even associate with them.

The following is quoted from the article which appeared in the *Los Angeles Examiner* as the reasons given therein are both logical and clear: "The various states of the nation have protected their citizens from incompetence in the compounding of medicines by licensing only qualified, trained pharmacists, and it is urged that the same rule be applied to the armed branches of the government." And again: "The fact that pharmacists are not given rank, places them in a bad position in view of the fact that all doctors are commissioned officers, while, as a matter of fact, the work of one is just as important for the welfare of the men as the other."

I sincerely hope that the matter already presented to Congressman Osborne of Los Angeles and Congressman Kahn of San Francisco, will be given as much publicity as possible, and that the drug stores of other cities will get behind this bill as Los Angeles is doing, by circulating petitions as widely as possible.

(Signed) HENRY N. CREGER,
Pvt. First Class, Med. Dept., U. S. A.

PRACTICAL INFORMATION ON BIOLOGICAL PRODUCTS FOR THE RETAIL DRUGGISTS.[1]

By ROBERT P. FISCHELIS.

Comparatively few druggists have yet organized their biological departments on a scale to yield the profit that should accrue from this branch of the drug business. Doubtless this has been due, in a large measure, to lack of knowledge of the possibilities from a business standpoint of making the drug store a biological station. Those who have tried the idea and have endeavored to build up a business on biological products are very well pleased with the results and it is difficult to see why there should not be a greater interest on the part of the rank and file to make the profit on biological products replace that which has been lost on some other commodities formerly handled to advantage by the retail druggist.

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[1] Presented at the annual meeting of the New Jersey Pharmaceutical Association at Spring Lake, June 17-19, 1918.

Business on biological products is a year-round business, but in order to make it so it must be given a certain amount of thought and there must be coöperation with physicians as well as some general advertising. A large part of the service connected with the supply of biological products is the ability to give information as to their character, method of production, storing and supply. The investment necessary is sufficient space for a good refrigerator, a fair stock of the products most frequently called for, and a conservative stock of those needed in special cases, as well as a little time each day on the part of the employer or one of the employees who makes it his business to keep abreast of the times as far as biological medication is concerned. The last-named investment is very important.

The sciences of bacteriology and immunology are making such rapid strides that few physicians are able to keep abreast of the most recent advances. They have learned to turn to the pharmacist for information on various drug products. Why should they not also turn to him for information on biologicals? Many drug store proprietors who are unable to give this department of the business the attention it demands designate one of their clerks to make a study of the subject and thus have someone ready to supply the information when it is asked for. Colleges of pharmacy are now giving special courses in bacteriology which fit their graduates to keep in step with the rapid progress being made in this science. A great deal of literature from various manufacturing houses is available on the newer products and this can be used to advantage by the pharmacist in connection with letters sent to physicians periodically, advertising the biological department of the store.

When most of us speak of biological products we immediately think of smallpox vaccine and diphtheria and tetanus antitoxins, and our study of the subject is limited to these products probably because they are the only ones recognized in the Pharmacopœia and are the ones mostly discussed in text-books. We all know something about the manufacture of diphtheria antitoxin and smallpox vaccine, and the general tendency is to classify all bacteriological products along with the two mentioned. The object of this paper is to outline briefly some information regarding other serums, vaccines and bacterial vaccines, that will be useful to the retail druggist particularly if he caters to business along this line.

One often hears physicians and pharmacists speak of "those vaccines" or "those serums," including in these terms the entire list of bacteriological products that are used in the treatment of disease, and it is not uncommon to hear the terms "vaccine" and "serum" used interchangeably without any apparent regard for their meanings. It should be borne in mind, therefore, that a serum is a product obtained by injecting horses or other domestic animals with toxins or bacteria in increasing amounts until the blood of the animal contains a sufficient number of antibodies to combat the disease and then bleeding and separating the serum that contains the antibodies from the solid portion of the blood.

In this connection, we should distinguish between antitoxic serums and antibacterial serums. The two serums recognized in the Pharmacopœia are antidiphtheric serum and antitetanic serum. Both are antitoxic serums and have been popularly known as diphtheria antitoxin and tetanus antitoxin. They are prepared by injecting horses, not with the bacteria causing diphtheria or tetanus, but with the toxins generated by these bacteria. Antistreptococcic serum and antipneumococcic serum are examples of antibacterial serums, because in those cases the organisms causing the infections are injected into horses in order to produce the antibacterial serums. In the case of tetanus and diphtheria, the antitoxin can be separated from the serum by precipitation with the proper chemicals and the precipitated antitoxin is redissolved in physiological saline solution and standardized. In this way a considerable quantity of antitoxin can be concentrated into a very small bulk. In the case of antibacterial serums, the finished product is the blood serum itself.

The term "vaccine" refers to a living organism or virus used to produce a mild form of the disease in that way stimulating the inoculated person or animal to produce anti-bodies and thus ward off infection. Smallpox vaccine and rabies vaccine are examples of vaccines. Quite a large group of products spoken of as vaccines are really not vaccines in the strict sense of the term, because they do not represent living germs. Among bacteriologists, they are known as bacterial vaccines or bacterins, consisting of suspensions of killed bacteria in physiological saline solution; and, when injected, they stimulate the mechanism of immunity to produce sufficient antibodies to ward off attacks of these organisms.

Bacterial vaccines or bacterins are by far the most numerous of the bacteriological products on the market and their use is being attended with considerable success. Prophylaxis against typhoid infection, respiratory infections such as common colds, meningitis, whooping cough, etc., is produced by the use of bacterial vaccines.

An improvement over the ordinary type of bacterin is the serobacterin or sensitized bacterial vaccine originated by Besredka of the Pasteur Institute of Paris. Serobacterins differ from plain bacterins in that they have been treated with specific immune serum and bring about a quicker immunizing response. To illustrate: the difference between typho-bacterin and typho-serobacterin is that typho-bacterin is merely a standardized suspension of killed typhoid organisms in physiological salt solution; whereas, typho-serobacterin is a standardized suspension of killed typhoid bacilli which has been sensitized by treatment with a serum prepared by injecting animals with typhoid organisms. This sensitization has the effect of reducing the local reaction that accompanies injection of bacterial vaccines and preventing severe genreal reactions which are sometimes caused by plain bacterins. Furthermore, the immunizing effect, when serobacterins are used. is almost immediate, manifesting itself within 24 to 48 hours; whereas, in the case of bacterins, several days are required to elicit any immunizing response.

The Use of Biological Products in the Present War.—The present war has brought out many important things in the scientific world. Among the most important, if not the most important, are the facts which are being made known regarding the specific effect of some of the biological products which have been in use for a number of years. When the war began, neither side was prepared for the many cases of tetanus which developed in northern France due to the condition of the soil which had been highly cultivated for many years. Tetanus organisms abounded there and from 10 per cent. to 12 per cent. of the wounded developed tetanus and 90 per cent. of these died of the disease. It did not take long to stop these enormous losses by the prompt use of tetanus antitoxin. It has been customary in the allied armies to give every wounded soldier an injection of 500 units of tetanus antitoxin at the first opportunity, followed by three other injections of 500 units each at intervals of a week, so that 2000 units are injected over a period of four weeks. Our own boys receive two injections of 1500 units each, the first injection being given immediately after the wounded soldier is brought to the first aid station, and the other injection a week or two later. Injections of 1,500 units can readily be made because of the highly concentrated serum that is being supplied from American sources. By precipitating the antitoxic substance and redissolving it in physiological saft solution and standardizing, 1,500 units can be concentrated into as small a bulk as five mils and, of course, the injection of so small a bulk presents no difficulties.

Another serious infection to which the wounded soldier is exposed is gas gangrene. It has been proved conclusively that gas gangrene is produced by the *Bacillus Welchii,* named for Professor Welch, of Johns Hopkins University, who discovered the organism. The effects of this bacillus are due to the toxin which it generates. It has been proved possible to prepare an antitoxic serum which will combat infections of this organism; in other words, gas gangrene is being combated in the same way as tetanus or diphtheria, both of which are due to the formation of toxins and for both of which there are antitoxic serums. A so-called dual purpose serum is now being prepared which will contain in the small bulk of ten mils, 1,500 units of tetanus antitoxin and ten units (American standard) of gas gangrene antitoxin. This is the first protective dose administered to wounded soldiers to prevent both lockjaw and gas gangrene.

Prevention of Typhoid Infections.—Typhoid has been eliminated in our armies by prophylactic vaccination. In the Spanish-American War we lost 2,744 men from typhoid alone. If the same percentage were to become infected with the disease during the present war our casualty list up to April 1, 1918, would number more than 217,000 from this disease alone. All this has been avoided by the simple expedient of injecting each man with the triple typhoid bacterin, sometimes also referred to as "triple vaccine," beginning immediately after their arrival at army camps and cantonments. The injections consisted of so-called typhoid vaccine, correctly named mixed typho-bacterin, which is made up of killed typhoid and paratyphoid A and B bacilli. The mixed vaccine is used because it was found that many men who had been immunized against typhoid fever later contracted paratyphoid fever caused by either the paratyphoid A or B organism. The so-called "triple vaccine" includes all three organisms and affords protection against them. Even including those cases where the men go to camp with the typhoid bacillus incubating in them—in every 100,000 there must always be some such "carriers"—the deaths to date in this war from typhoid number only eight, while as yet there has been no case whatever of ill effects resulting from the inoculation itself. In the French Army the monthly typhoid mortality is now less than three per million.

It is obvious that if every person outside of the army could be induced to submit to the same prophylactic vaccination against typhoid, the disease would just as quickly disappear from civil life.

Pneumonia.—Health reports from army camps and civilian communities during the past winter have made us realize the seriousness of the pneumonia menace. It has been known for some time that lobar pneumonia is caused by the pneumococcus, but serum treatment was in many cases a failure. This led to investigations which showed that there are various types of pneumococci and that serum effective against any one type is not effective against another. Researches at the Rockefeller Institute disclosed the fact that there are three fixed types of pneumococci and a fourth group of miscellaneous types. These have been named Type I, Type II, Type III and Type IV. The different types can be distinguised from one another by means of bacteriological tests, and it has been shown that Type I is responsible for about 33 per cent. of all cases of lobar pneumonia and that the mortality from this type, when serum treatment is not used, is about 25 per cent. About 31 per cent. of cases are due to Type II pneumococcus, the mortality rate being 32 per cent. without serum treatment; 12 per cent. of cases are caused by Type III pneumococcus, the mortality rate being estimated at 45 per cent. The fourth group of miscellaneous pneumococci causes about 24 per cent. of all cases of pneumonia, the mortality rate, 16 per cent. being the lowest of all.

Experiments have shown that pneumonia due to Type I pneumococcus is amenable to serum treatment. Thus far pneumonia due to Type II and Type III has not responded very favorably to serum treatment and there has been no success with serum in cases of pneumonia due to any of the pneumococci in group IV. When it is possible, through bacteriological examination, to determine the type of the infecting organism, it is desirable to use the serums specific for that type. However, many practitioners, particularly those residing in rural districts, do not have laboratory facilities at hand for making the diagnostic test and rather than deprive the patient of the benefit of serum treatment, since its early administration is of the utmost importance, it is advisable to use a polyvalent antipneumococcic serum, which is prepared by injecting horses with the three fixed types of pneumococci and therefore containing antibodies against all three types. The polyvalent serum is standardized against a Type I culture and must be as effiiecnt in its protective power against pneumonia due to Type I as the Type I serum. Besides, it contains antibodies against Types II and III and is therefore the logical serum to use in all cases of lobar pneumonia.

Common Colds.—It is generally conceded that "common colds," which so often lead to more serious complications such as pneumonia, are due to bacterial infections, and many annual sufferers from these infections have been relieved and have gone through a whole winter without "colds" by resorting to prophylactic immunization with Influenza Serobacterin Mixed. In some of the army camps, mixed bacterins composed of standardized suspensions of pneumococcus, influenza, catarrhalis, streptococcus and staphylococcus organisms have been used to immunize our boys against infections from these bacteria. Unquestionably the day is approaching when most diseases due to bacterial infection will be conquered as has already been the case with a number and it will be possible to immunize individuals susceptible to these diseases and thus prevent much suffering, to say nothing of the loss of time and inconvenience incident to long illness. Biological materia medica is still in its infancy. Less than 25 years ago diphtheria antitoxin, the first biological product manufactured and used to any extent by physicians, was first produced. Enormous strides have been made since then, and the present war is showing that the work along the lines of prevention and treatment with biological products in on a sane and sound basis. While many of our industries are engaged in the necessary work of providing the instruments for destruction, there is considerable satisfaction in the thought—and there should be particularly to pharmacists—that the medical and the pharmaceutical professions are unselfishly contributing their bit to the conservation of life.

THE CHEMISTRY OF DIPHTHERIA ANTITOXIN—A REVIEW.[1]

By Albert C. Crawford and Marjorie G. Foster.

The indications at present are that rational therapeutics will advance mainly by using chemotherapeutic methods, or by adopting those used by nature, that is, by the use of the products of various glands and of antitoxins, etc. With this latter idea in view, we have endeavored to present the results of investigations on the chemical nature of the diphtheria antitoxin, and hope to follow this summary with a report of our own experiments.

Up to the present time, very little has been ascertained as to the chemical nature of the antitoxins. Weichardt says that in spite of hundred-fold attempts to isolate the diphtheria antitoxin, as yet these have been futile.[2]

Reports differ as to the response of diphtheria antitoxin to reagents. Since the antitoxin has never been isolated, the colloids of the serum presumably may modify the reaction in various ways, and protect the antitoxin from their action. Normally the degree of concentration of colloids in the serum offers an obstacle to the activity of proteolytic ferments.[3] It may be that in a pure form diphtheria antitoxin might thus react differently than when in serum, in milk, or if combined with its toxin. Another explanation may be that the antitoxin is a colloid, at least under ordinary conditions, with a large molecule, and may contain numerous reactive groups. In colloids the properties due to chemical nature may be over-shadowed by their physico-chemical condition.

During immunization, lowering of the freezing point and of the osmotic pressure of the serum occurs. The electrical conductivity decreases in proportion to the antitoxic activity.[4]

According to Mellanby, a constant current (100 volts), if passed through a slightly acidified antitoxic serum by means of zinc electrodes, causes precipitation. The protein mass collected at the anode, when dissolved in weak NaOH, possesses antitoxic value. The serum also possesses antitoxic powers.[5] Precipitation by zinc ions may here play a part. But Field and Teague, using platinum electrodes, claim that both diphtheria toxin and its antitoxin are electro-positive and pass to the cathode from passage of the 110-volt direct current.[6] They claim the response is the same whether alkaline or acid solutions are used. However, the technique of these experiments of Field and Teague has been criticized by Landsteiner and Pauli[7] and by Bechhold.[8]

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[1] From the Division of Pharmacology, Stanford University Medical School, San Francisco, Cal. This report was supported by a grant from the Therapeutic Research Committee of the Council on Pharmacy and Chemistry of the American Medical Association.

[2] Abderhalden, E., *Biochem. Handlexikon,* Vol. 5, p. 518.

[3] Bronfenbrenner, J., *Proc. Soc. Exper. Biol.,* Vol. 13, p. 19, 1915.

[4] v. Szontagh, F., and Wellmann, O., *Deutsch. med. Woch.,* Vol. 24, p. 421; Butjagin, P. W., *Hyg. Rund.,* Vol. 12, p. 1209, 1902.

It is well to remember that certain proteins in neutral solution do not move toward either pole, but in acid solution travel toward the cathode, and in alkaline solution toward the anode.[9] An amphoteric electric character, which is important in maintaining the reaction of colloids, is better preserved in a large than in a small molecule.[10] As yet no one has succeeded in isolating antitoxin by means of the electric current.

Direct sunlight is injurious to antitoxin.[11] Short exposure, *i. e.*, several days, does not seem to materially injure it.[12] Long exposure (four months) to daylight decreases its activity.[13] The injurious action of yellow and of red light is slight (six months' exposure); that of blue light is somewhat more marked (five months); while green light does not affect it on three months' exposure, but after six months causes marked injury.[14] According to Müller, O, H, N and CO_2 injure antitoxin. The standard unit of diphtheria antitoxin in Germany is kept over P_2O_5 in vacuo and in the dark.

The experiments on dialysis with those on ultra-filtration and on diffusion of the antitoxin, open up the question of the size of its molecules or particles. Antitoxin, at least under the condition as we know it, does not dialyze through parchment paper.[15] We have no data as to whether certain membranes react with antitoxins or absorb them.[16]

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[5] Mellanby, J., Proc. Roy. Soc. London, Series B, Vol. 80, p. 399, 1908.

[6] Field, C. W., and Teague, O., *Journ. Exper. Med.*, Vol. 9, p. 86, 1907.

[7] Landsteiner, K., and Pauli, W., *Wien. med. Woch.*, Vol. 58, p. 1010, 1908.

[8] Bechhold, H., *Muench. med. Woch.*, Vol. 54, p. 1921, 1907.

[9] Hardy, N. B., *Journ. Physiol.*, 1899, Vol. 24, p. 288; Pauli, W., *Beitr. z. physiol. u. Path. Chem.*, Vol. 7, p. 531, 1905–6; see also Bancroft, W. D., *Journ. Phys. Chem.*, Vol. 19, p. 349, 1915.

[10] Pick, E. P., "Biochemie der Antigene." In W. Kolle and A. von Wassermann, "Handbuch der Microorganismen," 2d ed., Vol. 1, p. 703.

[11] Palmirski, L., and Orlowski, W., reference in *Cent. f. Bakter.*, Vol. 19, p. 916, 1896.

[12] Marenghi, G., *Cent. f. Bakter.*, Vol. 22, p. 520, 1897.

[13] Müller, F., *Cent. f. Bakter.*, Vol. 24, p. 316, 1898.

[14] Müller, *ibid.*, pp. 251, 316.

There is a variable loss of antitoxin when drawn through a Berkefeld or Chamberland filter. According to Dziergowski, it passes through uninjured.[17] Diphtheria antitoxin does not pass through a Chamberland filter, if the pores are closed by gelatin and the fluid is not forced.[18] It is held back by gelatin filters.[19]

Diphtheria antitoxin is retained by collodion filters.[20] The diffusion constant of diphtheria antitoxin against gelatin at + 6° C. is 0.0015, that of the toxin is 0.014, and of NaCl is 0.94,[21] and hence is a colloid, at least in the form we meet it, or so intimately associated with colloids as to react with them. Taylor believes it has more colloidal properties than its toxin, but no conclusions regarding molecular weight by the use of Thovert's relation are permissible.[22]

According to Zunz, charcoal absorbs as much toxin as antitoxin, but not the combination of the two. Proteins interfere with this absorption and $BaSO_4$ absorbs the toxin to a slight extent, but not the antitoxin, nor their combination,[23] while kaolin, argile, talc, kieselguhr, and wood charcoal absorb neither diphtheria toxin, nor its antitoxin, nor their combination. V. Groër and Kassowitz claim that antitoxin is absorbed by a kieselguhr filter.[24] Aluminium silicate does not absorb the antitoxin, although it absorbs the toxin. This absorptive power is favored by an alkaline reaction.[25]

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[15] For methods, see Gibson, R. B., *Journ. Biol. Chem.*, Vol. 1, p. 161, 1905; Pick, E. P., in Krause, R., and Levaditi, C., "Handbuch d. Immunitatsforschung," Vol. 1, p. 534; Seng, W., *Zeits. f. Hyg.*, Vol. 31, p. 516, 1899; Welker, W. H., *Biochem. Bull.*, Vol. 2, p. 70, 1912–13.

[16] See Tschirch, A., *Arch. Pharm.*, Vol. 252, p. 537, 1914.

[17] Dziergowski, J., *Cent. f. Bakter.*, Vol. 21, p. 333, 1897; Di Martini, L., *Cent. f. Bak.*, Vol. 24, p. 360, 1898.

[18] Corbett, L., *Cent. f. Bakter.*, Vol. 24, pp. 386, 415, 1898.

[19] Brodie, T. G., *Journ. Path.*, 1897, Vol. 4, p. 464.

[20] Goucher, L., *Bull. Sci. Pharm.*, Vol. 19, p. 129, 1913; also Bechhold, *Biochem. Zeits.*, p. 401, Vol. 6, 1907; Glenny, A. T., and Walpole, G. S., *Biochem. Journ.*, Vol. 9, p. 299, 1915.

[21] Arrhenius, A., "Immuno-chemistry," p. 25, 1907.

[22] Taylor, W. W., "Chemistry of Colloids," p. 309.

[23] Zunz, E., *Arch Internat, de Physiol.*, Vol. 8, p. 227, 1909.

[24] v. Groër, F., u. Kassowitz, K., *Zeits. f. Immunitäts.*, Vol. 22, p. 447, 1914.

Silicic acid purified electro-osmotically seems to have a certain capacity for absorption, less for the antitoxin and more for the toxin, than the corresponding acid not purified in this manner (Zunz). Palladium asbestos has been tested on the toxin, but apparently not on the antitoxin.[26] We have no data as to the action of ordinary asbestos on diphtheria antitoxin, but it absorbs 99.9 per cent. of its toxin.[27] Various vegetable gums have been found to inactivate the toxin,[28] but these have not been used on the antitoxin.

Direct sunlight with long shaking injures it. This may be due to increased exposure to aid (oxydation) or to some mechanical rearrangement of the molecules,[29] but apparently there is no data as to whether shaking in chemically indifferent gases injures it.[30]

Antitoxic serum is insensitive to low temperature. By freezing two or three times, Bujwid kept his antitoxic serum active for over one year.[31] But there is a report that Gorjansky noted a loss in activity from cold.[32] Serum deteriorates six times as fast at 36° C. as when kept on ice.[33]

The antitoxic serum is said to be slightly weakened by heating to 60–70° C.[34] Mellanby claims it can be heated to 66° C. without injury. The serum retains its antitoxic activity after five hours heating at 55° C.[35] Partial cogulations of proteins, if it occurs, may carry antitoxin with them, and thus lessen the antitoxic value of the serum. Heating it to boiling quickly destroys the antitoxic value of serum, but dried antitoxic serum will stand heating to 110° C. for one half hour, and heating to 140° C. for one quarter hour.[36] No doubt the response to heat will depend on the salts present. This has been found to be true in the case of certain toxins, etc. Buchner found that alkali sulphates added to dilute serum increased its resistance to heat 10° C. and raised its activity.[37]

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[25] Zunz, E., *Zeits. f. Immun.*, Vol. 19, p. 326, 1913.

[26] Biltz, W., Much, and Siebert, *Beitr. z. exper. Therap. von Behring*, 1905.

[27] Wyard, S., *Journ. Path.*, Vol. 18, p. 485, 1913–14; Coplans, M., *ibid.*, p. 581.

[28] Lindelsheim, *Zeits. f. Hyg.*, Vol. 42, p. 308, 1913.

[29] Palmirski, L., and Orlowski, W., ref. *Cent. f. Bakter.*, Vol. 19, 1916.

[30] Wiechowski, W., *Biochem. Zeits.*, 1917, Vol. 81, p. 278.

[31] Bujwid, O., *Cent. f. Bakter.*, Vol. 22, p. 287, 1897; Ernst, H. C., Coolidge, J. N., and Cook, H. A., *Journ. Boston Med. Soc.*, Vol. 2, p. 166, 1897–98.

[32] Madsen, T., in Krause, R., and Levaditi, C., "Handbuch d. Immunitätsforschung," Vol. 2, p. 110.

[33] MacConkey, A., *Journ. Hyg.*, Vol. 12, p. 511, 1912. See also Ito, T., *Zeits. f. Immun.*, Vol. 15, p. 97.

[34] Van de Velde, H., *Cent. f. Bakter.*, Vol. 22, p. 534.

[35] Müller, *l. c.*

Mellanby found that acetic acid (5 per cent.) and 0.25 per cent. HCl have no deleterious action on antitoxic serum at room temperature, but 0.05 Cc. n/10 HCl added to 1 Cc. of antitoxic serum weakened it. Dilute formic acid causes a precipitation from serum.[38] Weak alkalies dissolve certain antitoxic precipitates.[39] According to v. Groër and Kassowitz, dilute alkalies activate the antitoxin, while more concentrated alkalies destroy it. $Ba(OH)_2$ injures antitoxin.[40]

Digestion with 0.2 per cent. HCl and pepsin causes a rapid loss in activity.[41] It is slowly destroyed by tryptic digestion.[42] The addition of NaCl in solution will inhibit pepsin from digesting certain proteins.[43]

After saturation of the diluted (ten times) serum with CO_2, the precipitate contained only a trace of antitoxin.[44] Brieger and Krause passed CO_2 into a solution of antitoxin containing NaCl, $(NH_4)_2SO_4$ and glycerol, but the precipitate contained no antitoxin, while the filtrate was active.[45]

Chloroform, in 1 per cent. solution, is used as a preservative for antibodies, but causes a precipitate. Diphtheria antitoxin and toxin are very resistant to ether.[46] V. Groër and Kassowitz shook out antitoxic serum with ether and found that the serum retained its activity. This would suggest that the antitoxic agent was not a free lipoid. Antitoxin is not precipitated from serum by 25 per cent. alcohol. Higher percentages precipitate antitoxin according to the protein content.[47] Most of the antitoxin is precipitated by alcohol 35–45 per cent. The action is reversible only to a slight degree. Acetone precipitates antitoxin and long contact inactivates it.[48] Oxalic acid slowly injures it.[49]

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[36] Camus, M. L., *Soc. de Biol.*, Vol. 50, p. 235, 1898.

[37] Buchner, H., *Archiv f. Hyg.*, Vol. 17, p. 138, 1893; Ferrata, A., *Berl. klin. Woch.*, Vol. 44, p. 366, 1907.

[38] Brieger, L., and Krause, M., *Berl. klin. Woch.*, p. 946, 1907.

[39] Aronson, H., *Berl. klin. Woch.*, Vol. 31, p. 453, 1894.

[40] Freund, E., and Sternberg, C., *Zeits. f. Hyg.*, Vol. 31, p. 429, 1899.

[41] Mellanby; also Brieger, L., and Krause, M., *ibid.*

[42] Mellanby; v. Groër and Kassowitz, p. 449.

[43] Hamburger, W. W., *Arch. Intern. Med.*, Vol. 16, pp. 341, 508.

[44] Dieudonné, *Arb. d. Kais. Ges. Amt.*, Vol. 13, p. 293, 1897.

[45] Brieger, L., and Krause, M., *Berl. klin. Woch.*, 1907, p. 946. See also Hiss, P. H., and Atkinson, J. P., *Journ. Exper. Med.*, Vol. 5, p. 49, 1900–1.

[46] Pick, E. P., and Schwarz, O., *Biochem. Zeits.*, Vol. 17, p. 491, 1909.

Phenol is used in 0.3–0.5 per cent. solution to preserve antitoxic sera. This does not change its antitoxic content.[50] Tricresol (0.4 per cent.) is used to preserve antitoxic serum. Formaldehyde injures it. Putrefaction completely destroys antitoxin.[51]

Aluminium sulphate (5 per cent.) and potassium alum precipitate albumin from the serum, and the filtrate retains its antitoxic value.[52] Dilute NaOH, when added to this filtrate, causes a precipitate which holds the antitoxin. This latter precipitate is soluble in excess of NaOH when more than one third part of potassium alum has been added to the serum.[53]

Antibodies can be salted out or floculated by high electrolytic concentration.[53a] There are some data that even pure neutral salts on concentration may perhaps injure, or hold back, certain antigens,[54] and this perhaps might occur in the case of antitoxin. Salts with univalent cations, *i. e.,* NaCl, Na_2SO_4, $(NH_4)_2SO_4$, NH_4SCN, NH_4Br exercise no influence on the diphtheria-toxin-antitoxin combination in serum.[55]

Antitoxin is not precipitated by NaCl,[56] but NaCl and KCl as used by d'Astros and Rietsch, precipitated the antitoxin incompletely.[57] Likewise, a solution of $CaCl_2$ with NaCl precipitates antitoxin quantitatively from serum.[58] The filtrate after one half saturation with $(NH_4)_2SO_4$ contains no antitoxins,[59] while it is found in the precipitate. Na_2SO_4 (9–12 per cent.) precipitates 50 per cent. of the antitoxin from serum. Na_2SO_4 is used in place of $(NH_4)_2SO_4$ as a precipitant for the antitoxin in serum, partly because $(NH_4)_2SO_4$ is reduced to NH_3 by some albumins. It has about the same precipitating value as $(NH_4)_2SO_4$.[60] Dilute sera reacts differently with Na_2SO_4 than concentrated ones.

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[47] Mellanby.

[48] v. Groër, F., and Kassowitz, K., p. 448; Brodie, T. G., *Journ. Path.,* Vol. 4, p. 461, 1897.

[49] Brodie, p. 464.

[50] Freund and Sternberg.

[51] Brieger, L., *Festschrift f. R. Koch.,* p. 445, 1903.

[52] Freund and Sternberg.

[53] See also Rakuzin, M. A., *J. Russ. Phys. Chem. Soc.,* 1916, Vol. 48, p. 465; Rakuzin, M. A., and Flier, G. D., *ibid.,* p. 711.

[53a] See London, E. S., and Pakhotina, E. P., *Comp. rend. Soc. Biol.,* 1917, Vol. 80, p. 756.

[54] See Pick, E. P., "Biochemie der Antigene."

[55] Pick, E. P., and Schwarz, O.

[56] Brieger and Krause.

[57] D'Astros, L., and Rietsch, M., *Comp. Rend. Soc. de Biol.,* Vol. 52, p. 337, 1900.

[58] Brieger, L., and Boer, *Zeits. f. Hyg.,* Vol. 21, p. 259.

Salts with bivalent cations, *i. e.,* $Ca(C_2H_3O_2)_2$ 10 per cent. or $MgSO_4$ have no deleterious effect on the antitoxin or its combination with the toxin in serum. The colloids of the serum may perhaps protect the antitoxin from the action of calcium.[61] $MgSO_4$ at 30–37° C. precipitates only 50 per cent. of the antitoxin from serum,[62] but according to Freund and Sternberg the filtrate, after $MgSO_4$ precipitation, contains no antitoxin. These experiments were carried on at 17–18° C.[63] Strontium salts give negative results.[64]

Zinc salts are said to be especially suited for precipitation of the antitoxin. According to Brieger and Boer, $ZnSO_4$ and $ZnCl_2$ can be used for separating it quantitatively. The Zn precipitate can be dissolved in water by means of weak NaOH (one drop normal solution in 20 cc. H_2O) and then CO_2 can be used to precipitate the zinc. However by this method there is a question if all of the zinc is removed. In case $ZnSO_4$ has been used, the antitoxin remains in the precipitate, while if $ZnCl_2$ has been used, it goes into the filtrate. Freund and Sternberg obtained no precipitate of antitoxin with $ZnSO_4$ or $ZnCl_2$ after the use of potassium alum and aluminium sulphate even though the solution had been dialyzed eight days. They claim that zinc hydrate precipitates antitoxin. Cobalt salts gave negative results with antitoxin.[65]

The precipitate of iron salts with alkali carries antitoxin mechanically,[66] but it is difficult to free it.[67] The precipitate from the serum by K_4FeCy_6 and $ZnSO_4$ (*i. e.,* ferro-cyanide of zinc) contains antitoxin.[68] Aluminium sulphate and ammonia precipitate about 95 per cent. of the antitoxin from serum.[69] We have no published data as to the action of uranyl acetate or of phosphotungstic acid on antitoxin. The former has been used by Brieger in attempts to isolate tetanus toxin.

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[59] Freund and Sternberg.

[60] Brunner, J., and Pinkus, S. N., *Biochem. Zeits.,* Vol. 5, p. 381, 1907.

[61] Pick and Schwarz. See also Osterhout, W. J. U., *Bot. Gaz.,* 1915, 59, 316.

[62] Brieger and Boer.

[63] See also Brodie.

[64] Freund and Sternberg.

[65] Freund and Sternberg.

[66] Freund, E., and Sternberg, C., *Zeits. f. Hyg.,* Vol. 31, p. 429, 1899.

[67] In this connection, see Brossa, A., and Freundlich, H., *Zeits. Phys. Chem.,* 89, p. 306.

Brieger and Boer have used heavy metals in their work on the isolation of diphtheria antitoxin. Neutral lead acetate with a trace of NH_4HO precipitates albumin from serum, but the antitoxin remains in the filtrate. This can then be precipitated by shaking with $(NH_4)_2SO_4$, but the results are variable, owing to the solubility of the Pb combination. Brieger and Boer believe that antitoxin forms some combination with certain heavy metals and that this combination is soluble in alkalies. $HgCl_2$ will precipitate it if NaCl has been added to the solution.[70] $CdSO_4$ precipitates 50 per cent. antitoxin, and $CuSO_4$ has also been used as a precipitant.

Platinum chloride precipitates it.[71]

A solution of copper acetate (1 per cent.) causes a precipitate from antitoxic serum. This when dissolved by means of Na_2CO_3 and treated with CO_2 to remove Cu, is found to have antitoxic properties. However, the filtrate also contains some of the activity.[72]

Nucleohiston precipitates antitoxin.[73]

Nucleoproteins from various tissues possess antigenic properties.[74]

It has been suggested that there was some connection between the specific ferments of the blood and antibodies, but according to Bronfenbrenner—"No definite proof, however, of such an identification has been offered."[75]

Some of the work, which has been done on the chemistry of the diphtheria antitoxin, would suggest that this antitoxin is not a protein, thus Pröscher thought he could obtain an antitoxin free from proteins by digesting these away by means of trypsin,[76] but this work could not be confirmed by Mellanby, Banzhaf,[77] Pick, or Brieger.[78]

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[68] Aronson.

[69] Brieger and Boer, also Aronson.

[70] Brieger and Boer.

[71] Belfanti, S., and Carbone, T.

[72] Nikanorow, P. J., in *Jahresber. u. d. Fort. d. Tier-chemie*, Vol. 26, p. 983, 1897.

[73] Freund, E., Grosz, S., and Jelinck, O., *Cent. f. inn. Med.*, Vol. 16, pp. 913, 937, 1895; Tichomiroff, M., *Zeits. f. Physiol. Chem.*, Vol. 21, p. 90.

[74] Wells, H. G., *Journ. Biol. Chem.*, 1916, 28, p. 11.

[75] Bronfenbrenner, J., *Journ. Exper. Med.*, Vol. 21, p. 222, 1915.

Other work would indicate that the antitoxic power of the serum is in relation to the percentage of the proteins, hence a protein. According to Mellanby, heating and freezing both show that the concentration of the antitoxin follows the concentration of the protein on approximately parallel lines.

As Schryver says: "Not sufficient is know yet of the true chemical structure of the proteins to found a rational classification based upon differences of chemical constitution. The classification adopted therefore is more or less of an empirical nature, founded only to a small extent on chemical distinctions, but chiefly on crude differences in physical properties."[79]

Proteins can be carried out from solution by other colloids (*i. e.*, mastic or ferric hydroxide), and upon this property methods have been founded for separating proteins from solution.[80] The reaction is not always reversible, in that the protein cannot always be dissolved out from the precipitate by water. Certain proteins can also be removed from solution by solid substances, which act as absorbents, such as precipitated silicic acid, meerschaum, etc. From certain globulin solutions of about 2–3 pro m., the following absorbents take the following percentages:[81]

Meerschaum	100	$BaSO_4$	26
Precipitated SiO_2	100	$CaSO_4$	18
Iron oxide	97	S	2–3
Kaolin	64		
Serpentin	53		

This absorption is possibly a question of electro-chemical affinity.

Proteins can usually be precipitated from solution by means of neutral salts. "If a salt be added to a mixture of proteins, as soon as the limit of concentration is reached at which the more readily precipitated protein falls out precipitation will commence. The precipitate will contain, however, not only the protein of which the salt concentration limit has been reached, but also some of the less rapidly precipitable protein. The only method available, therefore, for separating water-soluble proteins from one another is an imperfect one and this fact accounts for a great deal of uncertainty as to the homogeneity of a large number of proteins which have been submitted to investigation."[82] Proteins, by virtue of their colloidal properties, can "protect" other colloids and prevent the latter from being precipitated from solution.

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[76] *D. R. P. K.*, Vol. 30, p. 13757, June 21, 1902.

[77] Banzhaf, E. J., *Johns Hopkins Hosp. Bull.*, Vol. 22, p. 106, 1911.

[78] Brieger, L., *Festschrift f. R. Koch.*, p. 445, 1903.

[79] Schryver, S. B., in Thorpe, E., "Dictionary of Applied Chemistry," Vol. 4, p. 407.

[80] Rona, P., and Michaelis, L., *Biochem. Zeits.*, Vol. 5, p. 365, 1907; Vol. 2, p. 219, 1906.

[81] Landsteiner, K., in Kolle, W., and v. Wassermann, A., "Handbuch d. Mikroorganismen," Vol. 2, pt. 1, p. 1246.

At present there is a tendency to believe that the "proteins fractions of plasma, such as, globulins, etc., are not chemical individuals, but form a series of which the individual members can pass one into another. The more complex proteins are assumed to be liberated from the cells in a state of low aggregation with comparatively small amounts of absorbed simple substances to keep them in a colloidally dispersed state, from which they can be readily flocculated by salts, etc. In the course of time, the state of aggregation is finer and the amount of absorbed substances is increased and the proteins are not then so readily precipitated. By alteration in the state of aggregation and amount of absorbed simpler substances, variations in the physical properties can be produced, and a blood protein can thus be varied in its properties so as to pass from a readily aggregating substance like fibrinogen through a globulin to an albumose."[83]

Diphtheria antitoxin is associated in some way with that division of the proteins which is known as the globulins, and is precipitated from serum by agents which precipitate globulins.[84] Like globulins, some antitoxins are precipitated by heavy metals.[85] However, Mellanby pointed out that the antitoxin did not correspond to the rigid definition of a globulin (p. 400). The globulins are insoluble in dilute acids, but are soluble in dilute alkali or in dilute neutral salt solution.

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[82] Schryver.

[83] Herzfeld, E., and Klinger, R., abst. in *Journ. Chem. Soc.,* Vols. 113–114, p. 87, pt. 1, 1918.

[84] Brodie; Atkinson, J. P., *Journ. Exper. Med.,* Vol. 5, p. 67, 1900–01; Belfanti, S., and Carbone, T., *Arch. Sci. Med.*, 1898, 22, p. 16.

[85] Ditthorn and Schultz, *Zeits. f. Immunitäts.,* pt. 1, Vol. 14, p. 103, 1912.

According to Starke, globulin in solution is an alkali or acid albumin.[86]

Carbonic acid precipitates globulins from dilute alkaline solution and dissolves them in excess.

The serum globulins are sensitive to reagents and easily denaturize, thus becoming insoluble. Heat, alcohol, and ether quickly precipitate them.[87] They are slowly split by ferments such as pepsin.[88]

Globulins do not form true salts with metals. The globulins have an acid nature and form combinations with alkalies. Histon, nuclein, neucleohiston, etc., are said to precipitate globulins.[89]

Acetic acid (0.25 per cent.) precipitates diphtheria antitoxin.[90] Acetic acid also precipitates globulins.

Admixed substances may determine the solubility of the globulins, as a globulin preparation soluble in water can become insoluble in water by purification, hence classifications based on solubility must be tentative.[91]

According to Hammarsten, "a sharp line cannot be drawn between the albumins and the globulins, follows from the fact that the albumins can be converted into globulins."[92] The first step in the transformation of albumin into globulin is the formation of pseudoglobulin. This change may be really a question of external properties of the albumin rather than to a true conversion into a globulin, as the resulting substance does not contain glycocoll, which is believed to be present in globulins.

On the addition of colloidal calcium phosphate and kieselguhr to diphtheria antitoxic serum, the ionized salts in the serum cause a precipitate, but the antitoxic value of the serum remains the same, showing that all colloids do not carry down antitoxin.[93]

[86] See *Physiol. Abst.*, 1918, Vol. 3, p. 100.

[87] Tebb, M. C., *Journ. Physiol.*, Vol. 30, p. 25, 1904. See also Chick, H., and Martin, C. J., *Journ. Physiol.*, 45, 61, 1912.

[88] Umber, F., *Zeits. f. physiol. Chem.*, Vol. 25, p. 258, 1898.

[89] See Osborne, in "Abderhalden Biochemisches Handlexikon," Vol. 4, p. 84.

[90] Gibson, R. B., *Journ. Biol. Chem.*, p. 169, Vol. 1, 1905–06.

[91] For methods of precipitation see Samuely, in Abderhalden's "Handbuch der Biochem. Arbeitsmethoden," Vol. 2, p. 360; Morawitz, in Oppenheimer's "Handbuch der Biochemie," Vol. 2.

[92] Hammersten, O., "Textbook of Physiol. Chem.," 7th ed., transl., 1912; p. 103 refers to Moll-Hofmeister's "Beiträge," Vols. 4 and 7.

[93] Mellanby.

Immune serum is influenced by salts according to physico-chemical laws of salt albumin combinations.[94] Ammonium sulphate in 50 per cent. saturation, precipitates globulins and antitoxin[95] from serum, leaving the albumin in solution, but precipitation of the albumin occurs when the ammonium sulphate saturation has reached 64 per cent. By this means it can be shown that the antitoxin is not an albumin or necessarily associated with them.[96] The fact that in the precipitation by ammonium sulphate there is no accumulation of antitoxin in any one fraction, would argue against a mechanical precipitation.

The response to $(NH_4)_2SO_4$ is different if the serum is first diluted with weak $(NH_4)_2SO_4$ and its $(NH_4)_2SO_4$ concentration then raised to one-half saturation, than when $(NH_4)_2SO_4$ is added directly to undiluted serum.[97] Highly concentrated sera have different precipitation quality than dilute.[98]

The globulins are usually divided into euglobulins and pseudoglobulins. By precipitation with $(NH_4)_2SO_4$, Freund and Joachim claim to have separated the true globulins into four fractions. By one third saturation, two fractions were obtained—one soluble in water, which was called "euglobulin" and one insoluble in water called "paraeuglobulin." By half-saturation two other fractions were obtained. The one soluble in water was named "pseudo globulin" and the one insoluble was called "para-pseudoglobulin."[99] The ammonium sulphate separation of euglobulin from pseudoglobulin is an artificial one,[100] and it is still uncertain whether euglobulin and pseudoglobulin are distinct proteins. The amino-acid content of the two fractions is approximately the same. Dale and Hartley find "that a rigidly specific sensitiveness to euglobulin occurs comparatively frequently "but they never succeeded by injection of pseudoglobulin in producing a sensitiveness to pseudoglobulin alone.[101] Chick suggests that euglobulins are formed by association of pseudoglobulin with a lipoid. Banzhaf believes a separation of the serum globulins by means of solubility in saturated NaCl is as sharp as can be made at present. The euglobulins precipitated from horse serum by saturation with NaCl content contain no antitoxin.[102] According to Dale and Hartley the purification of euglobulin is facilitated by its insolubility in weakly acidulated water.

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[94] Pick, E. P., and Schwarz, O., *Biochem. Zeits.*, Vol. 17, p. 491, 1909; Pribram, E., *Wien. klin. Woch.*, 1908, p. 1079, Vol. 21. Look up Oryng, T., and Pauli, W., *Biochem. Zeits.*, 1915, Vol. 70, p. 368.

[95] Freund and Sternberg.

[96] Banzhaf, E. J., and Famulener, L. W., "Collected Studies," Bureau of Laboratories, N. Y., Vol. 8, 1914–15, p. 208.

[97] Popplewell-Bloxham, W., *Proc. Physiol. Soc. Journ. Physiol.*, Vol. 26, p. xxxiii, 1901.

[98] Brunner, J., and Pinkus, S. N., *Biochem. Zeits.*, Vol. 5, p. 381.

[99] Freund, E., and Joachim, J., *Zeits. physiol. Chem.*, Vol. 36, p. 406, 1912.

[100] Banzhaf and Famulener.

Shaking a serum with air is said to produce coagulation and denaturation of the euglobulin, due to alteration in surface energy, leading to absorption of albumin, thus rendering the euglobulins labile; they then coagulate and become insoluble. The process is not due to oxidation. Previous heating and the presence of a hypertonic medium tends to inhibit the effect of shaking, but dilution with H_2O or storage, rendering the euglobulins labile, favors the effect of shaking.[103] Fibrinoglobulin, which belongs to the euglobulin fraction, does not contain the antitoxin.[104]

The globulins of horse serum insoluble in water (precipitating on dialysis) correspond to the globulin fraction precipitated by 28–36 vol. per cent. of $(NH_4)_2SO_4$, and those soluble in water correspond to the fraction precipitated by 36–44 volume per cent. $(NH_4)_2SO_4$.[105] According to Ide and Lemaire the antitoxin is all precipitated by from 26–44 per cent. $(NH_4)_2SO_4$.[106]

Only a portion of the globulins seems to contain or carry the antitoxin with it.[107] The coagulation temperature for the "soluble globulins" in immune serum is claimed to be different from that in non-immune;[108] *i. e.*, in normal serum it ranges from 65 to 71° C., but in immune serum it begins to precipitate at 71° C. with a maximal coagulation at 75° C. According to Brunner and Pinkus[109] antitoxin of immune serum has not the same precipitation limits as the globulins of normal serum.

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[101] Dale, H. H., and Hartley, P., *Biochem. Journ.*, Vol. 10, p. 429, 1916.

[101a] Chick, H., *Biochem. Journ.*, Vol. 8, p. 404, 1914.

[102] Banzhaf, E. J., *Johns Hopkins Hosp. Bull.*, Vol. 22, p. 106, 1911; Banzhaf, E. J., and Gibson, R. B., *Journ. Biol. Chem.*, Vol. 3, p. 253, 1907.

[103] Schmidt, H., *Journ. Hyg.*, Vol. 14, p. 399, 1914.

[104] Pick.

[105] See Ficker, M., in Kolle, W., and von Wassermann, A., "Handb. der path. Mikro-organismen," Vol. 2, part 1.

[106] Ide and Lemaire, *Arch. internat. Pharmacodyn.*, Vol. 6, p. 477.

[107] Belfanti, S., and Carbone, T., *Cent. f. Bakt.*, Vol. 23, 1898, p. 907.

[108] Seng.

[109] Brunner, J., and Pinkus, S. N., *Biochem. Zeits.*, Vol. 5, p. 381, 1907.

The diphtheria antitoxin globulins have a higher value for cystine nitrogen than have globulins described by Hartley. The histidine nitrogen is lower and the amino nitrogen is slightly higher.[110] According to Seng, the "soluble globulins" of antitoxic serum show an increase in N and C with a diminution in H and possess a higher rotation of the plane of polarization. However globulins of normal and of immune serum have the same freezing point.[111]

Hiss and Atkinson[112] found that the average precipitate with $MgSO_4$ from the sera of immunized horses was more abundant than the average precipitate from the sera of non-immunized horses. This precipitate would contain both the normal globulins of the serum, which have no antitoxic action, and the globulins, which have antitoxic value. The increase in globulin precipitate is not necessarily proportinate to the increase in antitoxic value. Seng found an increase of the so-called "soluble globulins" at the expense of the insoluble ones. According to Joachim,[113] the total protein content of the serum of non-immune animals is only slightly less than in the immune and the globulins increase at the expense of the albumins. These results of Joachim were corroborated to some extent by Langstein and Mayer (1904) who found that in rabbits immunized against typhoid, pneumococcus, streptococcus, etc., the serum globulin rose while the albumin diminished. Joachim believed the increase was mainly in the inactive euglobulin fraction. Others, as Butjagin,[114] also Szontagh and Wellmann[115] claim that the proteins increase during immunization, although the latter workers suggested it might be due to disturbed nutrition. In one horse used by Ledingham the globulin content of the serum showed only a slight change, although the albumin increased, but in this case the serum failed to yield a high grade antitoxin.[116] In a second horse there was a marked increase in globulin content and reduction in albumin along with the increase in antitoxic value. The increase in globulin was mainly in the euglobulin fraction. Ledingham says that the pseudoglobulin and especially the euglobulin fraction are involved in this increase. In the organs, an increase in globulins has not been shown.[117]

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[110] Banzhaf, E. J., Suguira, K., and Falk, K. G., "Collected Studies," Bureau of Laboratories, New York, Vol. 8, 1914–15, p. 213.

[111] "Data on Chemistry of Globulins." See Hartley, D., *Biochem. Journ.*, Vol. 8, p. 541, 1914. See also Rakuzin, M. A., "Optical Activity of Albumins," *J. Reiss. Phys. Chem. Soc.*, Vol. 8, p. 1251, 1916.

[112] Hiss, J. H., and Atkinson, J. P., *Journ. Exper. Med.*, Vol. 5, 1900–01, p. 47.

[113] Joachim, J., *Arch. f. gesam. Physiol.*, Vol. 93, 1903, p. 593.

[114] Butjagin, P. W., *Hyg. Rund.*, Vol. 12, p. 1208, 1902.

[115] v. Szontagh, F., and Wellmann, O., *Deutsch. med. Woch.*, 1898, p. 109.

[116] Ledingham, J. C. G., *Journ. Hyg.*, Vol. 7, p. 65, 1907.

It has been urged that perhaps an increase in the globulins of the serum during immunization may be due to changed nutritive conditions; as Githens found an increase in globulins of serum in hungering dogs (1904) and Glässner found that during immunization of rabbits with certain bacterial products a rise in the globulin fraction occurred only if the animal showed severe metabolic changes, but that on cautious immunization this need not appear.[118] The fact that during immunization waxy disease, hepatic hemorrhages, etc., occur would indicate that profound metabolic changes often are produced during immunization.

According to Pick[119] in goat serum the antitoxin is associated with the euglobulin, but in the case of horse serum it is associated with the pseudoglobulins, and while Ledingham found an increase in the globulins in horse serum during immunization, which increase was mainly in the euglobulins, he says that the greater part if not all the antitoxin is associated with the pseudoglobulins, at least when the antitoxin content of the serum is rising. In his experiments with goats he failed to corroborate Pick's finding, that antitoxin was invariably associated with the euglobulins. In the refractory period where abnormal metabolic changes were marked, Legingham thought it might be associated with the euglobulins. Ledingham found that during immunization of goats the rise in total protein affected mainly the albumin. The recent work of Banzhaf and Famulener indicates that in goats the unit content and protein increase have no relation. "The unit relationship per gram protein of the pseudoglobulin and euglobulin remained practically the same during the course of the immunization." Banzhaf also found that in horse serum the increase is in the pseudoglobulins, and that the euglobulins contain no antitoxin.[120]

"Pick noted that tetanus antitoxin was precipitated with the pseudoglobulins. However, this association of the antitoxin with one or other globulin is claimed by Pribram to be not always constant, but to vary according to the preservation of the serum, etc. Gibson and Collins have demonstrated the untrustworthiness of any such differentiation of the antibodies as those contained in the euglobulin and those of the pseudoglobulin."[121]

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[117] Pick.

[118] Glaessner, K., *Zeits. f. exper. Path.*, Vol. 2, 1905–06, p. 154.

[119] Pick, *Beitrag path. Chem.*, Vol. 1, 1902, p. 362.

[120] Banzhaf and Famulener.

In Hurwitz and Meyer's experiments on immunization, it was found that in rabbits the globulins of the serum only increased when the animals reacted severely, but if the immunization was carried out carefully and with a well-controlled dosage it is not usually accompanied by an increase in the serum globulins, although the immune bodies may attain a high concentration. The rise in globulins occurs long before the animal develops immune bodies in any appreciable concentration.[122] However, it may be remembered that an increase in pseudoglobulins with which the antitoxin is said to be associated might theoretically occur without an increase in total globulins.[123]

Banzhaf believes that when the pseudoglobulins are separated by fractional precipitation with $(NH_4)_2SO_4$, the higher fraction contains more of the antitoxin per gram protein. Acetic acid in small amounts precipitates the pseudoglobulins in saturated sodium chloride solution.[124]

According to Banzhaf the serum of horses immunized to diphtheria contains 12 per cent. albumin; pseudoglobulin 78 per cent. and euglobulin 10 per cent., while in normal non-immunized serum, albumin is present in 40 per cent., pseudoglobulin in 42 per cent. and euglobulin in 18 per cent.

Moll found that serum heated to 56° for one half hour showed a globulin increase[125] without an increase in alkali albuminate. Heating rabbit serum to 58° C. for one hour, in some cases the euglobulins increased in amount; in other cases the pseudoglobulins increased. In Banzhaf's experiments, on heating horse serum 12 to 15 hours at 57° C. the albumin content fell from 12 per cent. down to 9 per cent.; while the pseudoglobulin fell to 50 per cent. from a normal of 78 per cent., and the normal 10 per cent. of euglobulins increased to 41 per cent. Banzhaf believed the pseudoglobulin was converted to euglobulin. As all the antitoxin, save 7 per cent. lost in heating, is in the pseudoglobulin, the pseudoglobulin is not necessarily antitoxin and Banzhaf argued that a separation of antitoxin and pseudoglobulin could thus be partially affected by heat.[125a] Heinemann claims that pseudoglobulins may be split into fractions, some of which do not contain antitoxin.

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[121] Gibson, R. B., and Collins, K. R., *Journ. Biol. Chem.*, Vol. 3, p. 238.

[122] Meyer, K. F., Hurwitz, S. H., and Taussig, L., *Journ. Inf. Dis.*, 1918, Vol. 22, p. 1; Hurwitz, S. H., and Meyer, K. F., *Journ. Exp. Med.*, 1916, p. 515. See also Belfanti and Carbone.

[123] See also Schmidt, E. S., and Schmidt, C. L. A., *Journ. Immun.*, 2, 1916–17.

[124] Gibson, R. B., *Journ. Biol. Chem.*, Vol. 1, p. 169, 1905–06.

[125] Moll, I., *Beitr. z. Physiol. u. Path. Chem.*, Vol. 4, p. 563, 1904; *Zeits. f. exper. Path.*, Vol. 3, p. 325, 1906.

By refractometer determinations Homer finds that the pseudoglobulins are not diminished by the Banzhof method, and claims there is not a conversion of pseudoglobulin into euglobulin, "but rather a more simple physical process involving the agglutination of the particles of the euglobulin already thrown out of emulsoid suspension by the ammonium sulphate. This agglutination permits of easy separation of the euglobulin by filtration through paper."[126] Heat denaturation in alkali sera slowly occurs.

It would seem that a simple method of proving whether the diphtheria antitoxin was a protein or not, would be to find whether it occurred in secretions which contained little or no protein, or a protein which could be easily removed.[127]

Milk of immune animals has been studied. Ammonium sulphate (27–30 per cent.) precipitation from goat's milk gives an antitoxin preparation 400 to 600 times as powerful as the original milk.[128] This precipitate contains 14 per cent. ammonium sulphate, but this method has shown no further results.

According to D'Arsonval and Charrin, the constant current destroys the diphtheria toxin,[129] while the high-frequency current causes molecular changes in the toxin, but they were unable to make diphtheria antitoxin by this method. Bonome and Viola, using this method, claim to produce an antitoxin to streptococci.[130]

According to Ostromisslenski[131] all antitoxins are globulins. The specificity of an antitoxin is determined by the physical condition of its colloid particles and only the physical condition of an antitoxin distinguishes it from normal globulins. In some cases globulins may combine with toxins by means of heat alone. Thus if the toxin of certain staphylococci is heated with rabbit serum at 60°, the globulin is converted into an antitoxin,[132] but usually this requires a catalytic agent. Diphtheria antitoxin is claimed to have been made from normal horse serum or globulin of eggs by means of a catalist (NaCl)[133] but this work has not been corroborated and as yet the question of the chemical nature of this antitoxin remains unsettled. According to Berg and Kelser's work the evidence points to a non-protein character for the *tetanus* antitoxin.[134]

[125a] *Journ. Infect. Dis.*, p. 438, Vol. 19, 1916.

[126] Homer, A., *Biochem. Journ.*, Vol. 10, p. 292, 1916; Vol. 11, p. 21, 1917.

[127] Wassermann, A., *Zeits. f. Hyg.*, Vol. 18, p. 235, 1894; Brieger, L., and Ehrlich, P., *Zeits. f. Hyg.*, Vol. 13, p. 336, 1903.

[128] Brieger and Ehrlich.

[129] d'Arsonval and Charrin, *Comp. rend. hebd. Soc. de Biol.*, Vol. 3, 3 s., 1896, pp. 96, 121, 153, 719.

[130] Bonome, A., and Viola, G., *Cent. f. Bakter.*, Vol. 19, 1896, p. 849.

[131] Ostromisslenski, I. I., *Journ. Russ. Phys. Chem. Soc.*, 1915, Vol. 47, pp. 263, 301. From *Journ. Chem. Soc.*, Vols. 107–108, p. 751, 1915.

NORMAL SALT SOLUTION.[1]

By Louis Gershenfeld, P.D., B.Sc.

The term "normal" has been and is most frequently applied by the chemist and pharmacist to solutions which contain a given weight of chemical that bears a direct relationship to the molecular weight of the particular substance. The same term is, however, used more frequently by the practitioner and medical man, when the psysiological salt solution is desired.

Normal or physiological salt solution was first used by anatomists as a means of preserving fresh tissue for histologic examination, its superiority over pure water, which has been found absolutely unsatisfactory, having been early recognized. This preparation originally and until recently had a sodium chloride content of only 0.6 per cent. Its subsequent adoption by physiologists to preserve the normal irritability of isolated tissue preparations undergoing investigations, and its wide employment in the physiologic laboratory in practically the same saline concentration as that which was originally used, led to the general belief and acceptance for a number of years that such a solution is the physiologic salt solution.

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[132] Ostromisslenski.

[133] Ostromisslenski.

[134] Berg, W. N., and Kelser, R. A., *Journ. Agric. Res.*, 1918, Vol. 13, p. 471.

[1] Presented at the meeting of the Pennsylvania Pharmaceutical Association, Wilkesbarre, Pa., June, 1918.

Some 35 years ago, Kronecker and Souder demonstrated that dogs, which have been previously bled almost to the point of death, could be restored to life by a subsequent infusion of a so-called physiologic salt solution, prepared in a saline concentration of 0.6 per cent. Control animals brought to an identical condition invariably died. It was perhaps these experiments that paved the way for the constant use of a 0.6 per cent. sodium chloride solution, and it was demonstrated later that the saline concentration of the blood in dogs and other animals, and especially the herbivora, was invariably lower than in the human being.

Soon thereafter Dr. Goltz produced revolutionary methods of treatment in cases of profuse hemorrhage, and salt solution immediately became a therapeutic measure, replacing the unfavorable and uncertain though commonly used method of blood transfusion; and as Dr. Cushing of Johns Hopkins well states, "soon took the preference over all other irrigations in preventing post operative thirst, flushing out septic material and that for certain conditions, especially those associated with loss of blood and its concentration from dehydration of the tissues, no other efficacious form of treatment is available; that in a great number of intoxications and infections, the infusion chiefly by inducing an associated renal activity, plays the part of diluting and washing out the toxic products."

The isotonicity of the blood and the concentration of solids in the liquor sanguinis (which with its complex composition acts as a vehicle for the transportation of the solid elements, and thus becomes the main food carrying body to the tissues) varies considerably under different clinical conditions, and at the present time we have no means of determining it for the individual case. Every tissue cell has an osmotic pressure, which as far as has been ascertained, seems to be about the same for all cells (with only slight variation) throughout the body; and accordingly, the concentration of the liquor sanguinis will remain in normal individuals about the same all the time, so as to give a constant and identical pressure from without the cell, equal to the osmotic pressure of the cell itself.

Hamburger (*Zeitschrift f. Biol.*, 1889, 92, 97) by a test which depended on the percentage of saline which failed to lake the red cells; and another worker, who by the determination of the freezing point of various samples of blood, were able to determine the saline content of blood. The latter experiments were performed by observing the freezing point of blood in a Beckmann apparatus. From the reduction of the freezing point as compared with distilled water, the saline content was then determined in terms of sodium chloride, by calculation; and a solution could thus be prepared that was in each case isotonic with the blood (*i. e.,* had the same reduction of the freezing point). From such data as the foregoing, a number of workers showed that a 0.9 per cent. solution was safe and proper to employ for human beings, if a solution that was desired to be only monotonic was to be employed, without considering the molecular concentration of the liquor sanguinis. I might state here that a 0.9 per cent. and not 0.85 per cent. sodium chloride solution is used and recommended by numerous physiologists and medical men as the normal physiologic salt solution. A preparation of similar concentration as the normal solution to be used in Great Britain is quoted in Squires Companion to the British Pharmacopœia (1916 edition) as possessing the same osmotic pressure as blood and said to be isotonic.

Solutions that possessed a higher saline concentration than the foregoing were said to be hyperisotonic, while those that contained less sodium chloride than the normal solution were said to be hypo or hypisotonic.

It is surprising that the British Pharmacopœia does not consider officially this preparation. In the Deutsches Arzneibuch (1910), this solution (official as solutio natrii chlorati physiologica) is the filtered and sterilized solution containing 8 Gm. natrium chloride and .150 Gm. of natrium carbonate and 991.85 Gm. of water.

In the U. S. P. IX, liquor sodii chloridi physiologicus (as the official latin name) instead of a 0.9 per cent. is a .85 per cent. sodium chloride solution. The formula calls for recently distilled water, a great improvement over the old products as Hort and Peafold of the Lister Institute (*British M. Journal,* No. 2659, 1911) have shown that distilled water that is allowed to stand in sealed sterile containers and subsequently used as an infusion gives rise to certain toxic symptoms (as fever, etc.), the cause of which has not been fully explained. Similar symptoms are not at all observed if recently freshly distilled sterile water is employed. The pharmacopœia further recommends that the solution should be sterilized preferably in the autoclave or by boiling for one hour in a sterile cotton plugged container. The former method is employed in laboratories where the autoclave is at hand, but the average druggist and practitioner must necessarily use the other method. It would be interesting to know why the pharmacopœia requires aqua destillata sterilisata to be boiled only for a half hour and normal salt solution is required to be boiled for one hour, (except for the reason that normal salt solution may be regarded as being better fitted to support bacterial life). But besides this slight error of nonuniformity, the greatest error perhaps is in not requiring a replacement by recently freshly distilled water of that portion that has been lost during evaporation. As the formula now stands, the physician, when using normal salt solution (sterilized by boiling) does not administer a .85 per cent. sodium chloride solution but a more concentrated product or one which really is slightly hypertonic, and at that, each subsequent solution prepared varies in strength depending upon the degree of heat used in boiling. To fully ascertain the loss by evaporation during sterilization by the various methods available, the following experiments were performed.

Five gallons of normal salt solution were prepared, as directed by the U. S. P., which upon titration was found to contain accurately .85 per cent. NaCl.

3 (1,000 Cc. non sol.) flasks,
3 (500 Cc. non sol.) flasks,
3 (100 Cc. non sol.) flasks,

were selected so that the mouth of each respective set of flasks were of about the same diameter. These were then cotton-plugged and sterilized at 160° C. for one hour. The nine flasks were then divided into three sets, each set consisting of a 1,000-Cc. flask, a 500-Cc. flask, and a 100-Cc. (filled respectively with 1,000 Cc., 500 Cc. and 100 Cc. of salt solution). One set was autoclaved at 15-pound pressure for twenty minutes, the other set was heated in a steam sterilizer (made by generating steam in a bucket containing a false bottom), and the third set was heated by boiling moderately for one hour. The same test was repeated on two different dates. After each sterilization, the flasks were allowed to stand for twenty-four hours, until cooled to room temperature, the content of each flask was noted to find the loss in evaporation and 10 Cc. of each were titrated to accurately determine the NaCl content. At the end of the experiment, an average of each set (*i. e.*, the identical sets heated at three different occasions) was taken and recorded in the following table. (See Table I.)

TABLE I.

Original Solution.	Cc.		Average Content of NaCl in Three Flasks Treated at Different Occasions as Determined by Titration,	Average Loss of Water Determined by Measuring and Calculation,	Content Determined by Titration with ag No_3V. S.,
			Per Cent.	Per Cent.	Per Cent.
Original		1	—	—	0.85
Sterilized in autoclave at 15-lb. pressure for 20 minutes.	1,000 flask	2	.871	2.4	
	500 "	3	.860	1.17	
	100 "	4	.882	3.76	
Sterilized by boiling for one hour.	1,000 "	5	1.075	26.4	
	500 "	6	.946	11.2	
	100 "	7	1.194	40.4	
Sterilized by heating in steam for one hour.	1,000 "	8	0.85	No loss	
	500 "	9	0.85	" "	
	100 "	10	0.85	" "	

From these experiments, if we strike a further average between the different sets used from flask 2, 3, 4, we will obtain an average loss of 2.4 per cent. moisture, which will give a salt content of .871 per cent. Sets 5, 6 and 7 will give an average loss of 26 per cent. moisture, which in turn will give a salt content of 1.07 per cent. Sets 8, 9 and 10 show no loss at all. Whether this method is, however, effective as a means of sterilization will be reported in another paper later on.

From these experiments we are led to the conclusion that heating in the steam sterilizer is the best sterilization method to be employed by the average physician and practitioner so as to avoid concentration of the solution. The autoclave (if at hand) is, of course, to be preferred as it is undoubtedly a more effective method of rendering material sterile, while an average concentration to .871 per cent. of sodium chloride will not bear any marked relationship to the isotonicity (.85 per cent.) of the end product. But mere boiling is not to be recommended, unless the water of evaporation be directed to be replaced by freshly distilled sterile water. In addition to bearing perhaps only a slight relationship to the isotonicity of the physiologic solution, the product that will be used from time to time will vary greatly depending upon the size of the container used, the amount of solution that is boiled and the activity of the boiling, and if for no other reason than for more constant uniformity in preparations, the recommendations offered should be considered.

It might be interesting to consider and observe what effect salt solutions of different strengths will have on the red blood cells or erythrocytes.

The following experiment was performed at two different occasions:

An accurately (chemical titrated) 2 per cent. sodium chloride solution with distilled water was prepared. From this, salt solutions of varying strength were made by dilution with distilled water as observed in Table II.

Into separate one mil tubes, a mil of each dilution was placed. I then asceptized my finger and after examining a drop of my blood (carefully observing the size and shape of the red blood cells), one drop of blood was placed into each tube. The contents in each tube were then well shaken and incubated in an incubator at body temperature (37° C.) for one hour. At the end of this period of incubation, each tube was examined macroscopically to see whether they show erythrocytolysis or as it is more commonly termed hemolysis (*i. e.,* the destruction of the erythrocyte or red blood cells and consequent liberation of the hemaglobin, with the production of a transparent red color). The tubes were then allowed to stand twenty-four hours. At the end of this time the tubes were centrifugalized and the sediment of red blood cells was examined microscopically, so as to observe the size and shape of the erythrocytes. This is all recorded in Table II.

Table II.

Original Blood 6 to 8 μ.

Strength of Solution, Per Cent.	One Mil of Solution Plus One Drop of Blood Incubated for One Hour at 37° C.	Size of Cells at End of 24 Hours Incubation. In all Cases an Average was Taken After 50 Cells were Counted.	Shape of Cells at End of 24 Hour Incubation.
.3	Complete hemolysis (H.)	No cells—all ruptured with liberation of hemoglobin	
.5	Slight H.	8 μ to 9 μ	Slightly bulged
.7	No. H.	7 μ to 8 μ	
.85	No. H.	6 μ to 8 μ	
.9	No. H.	6 μ to 7.5 μ	Very little variation in shape
.1	No. H.	5 μ to 6 μ	Variety of shapes
1.1	No. H.	Average 5 μ	Crenated and varied shape
1.3	No. H.	Average 4 to 5 μ	Varied shape
1.5	No. H.	Average 4 μ	Varied shape
1.8	No. H.	3 to 4 μ	Most all cells were crenated
2	Slight hemolysis	3 μ	Most all cells were crenated

From this experiment we may observe that hypoisotonic saline solutions increase the size of the red blood cells and pharmaceutically speaking may be said to have a solvent effect on these corpuscles, while hyperisotonic solutions produce a most marked toxic effect and crenate the erythrocytes (either by dehydrating or due to its high osmotic pressure). It is perhaps due to similar reasons that hypotonic saline solutions (30 grains to the pint) were used in severe malarial conditions (*British Medical Journal,* ii–i, 197) and hypertonic solutions were used in ascites and more recently recommended by Sir A. E. Wright in 5 per cent. solutions as an irrigation in war wounds.

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THE DETERMINATION OF MORPHINE IN COMPLEX PRODUCTS.

Part II. Mixtures Containing Morphine as a Simple Salt.

By Alfred Tingle, Ph.D.

INTRODUCTION.

The object of the work here described was to devise a reliable and fairly general method for the determination of morphine, not only in simple powders or tablets, but in pills of complex composition. The examination of opium and preparations thereof does not come within the scope of the present communication, but will be dealt with in Part III.

The writer has found no method yet published which could be applied to much of the material which has come into his hands for analysis. The greater part of it has been of Asiatic origin, and till the methods about to be described had been evolved, the analytical difficulties corresponded to the unusual methods of preparation. The simple extraction method proposed by J. B. Williams (Amer. Jour. Pharm., 1914, 86, 308–312) is excellent within its limitations, but as it stands is useless for wide general application.

In dealing with pills (and especially Asiatic pills) analytically, the first difficulty is to obtain a filterable solution. The most usual result of digestion with water is to produce a "mush," or an emulsion, in which the solids remain indefinitely suspended. The addition of alcohol, acids, lime and lead acetate seldom has any effect, besides leaving a complete uncertainty as to whether any morphine present will be in the solid or in the liquid portion. Barium hydroxide was found very effective in rendering these extracts amenable to filtration, and it has the added virtue of completely dissolving any morphine, no matter in what form it may be present. The subsequent separation of morphine in a form sufficiently pure for titration was effected by an adaptation of J. B. Williams's method. The errors shown to accompany the precipitation of morphine by ammonium hydroxide in the presence of alcohol (see Part I) render such a mode of procedure most undesirable.

DETAILED DESCRIPTION OF METHOD.

The material to be examined, if a solid, should be divided as finely as possible. Weigh a sample of 6 Gm. and transfer it to a 100 Cc. graduated flask. Add approximately 2 Gm. of pure calcium carbonate and mix by gently shaking, then add 20 Cc. of water and warm on the water bath till a uniform thin paste has been formed. While the warming is in progress the flask should be loosely closed by a rubber stopper. Cool the mixture, then add 60 Cc. of a cold saturated solution of barium hydroxide. Mix the contents of the flask thoroughly and allow to stand for 20 to 30 minutes. Dilute with water to 100 Cc., mix well, and pour on a dry 15 Cm. filter paper.

Treatment of Precipitate.—Transfer the residue on the filter to a beaker, add a slight excess of hydrochloric acid, warm almost to boiling, and filter. Collect as much as possible of this filtrate and concentrate to about 15 Cc. Test this with ferric chloride for meconic acid. Its presence indicates that any morphine in the pills being examined is in the form of opium, in which case the method of determination about to be described cannot be used, and the modification which will be described in Part III must be employed. If no meconic acid is found the course to be followed is as now described.

Treatment of Filtrate.—Transfer 50 Cc. of the filtrate to a flask graduated to contain 55 Cc., such as is commonly used in the analysis of syrups and sugars. Add sulphuric acid (diluted 1 : 5) very cautiously, till all barium has been precipitated and the solution is just acid to litmus. Dilute the contents of the flask to the 55 Cc. mark and mix thoroughly. Allow the precipitate to settle; filter through a dry 7 Cm. paper. Transfer 50 Cc. of the filtrate to an evaporating dish, and add sodium hydroxide solution, drop by drop, till the stirred liquid is just alkaline to litmus paper. Add hydrochloric acid with equal care till the solution is acid once more, then evaporate as rapidly as possible on the water bath till the volume of liquid remaining does not exceed 5 Cc. Do not evaporate to dryness. Transfer the contents of the dish to a small separating funnel, washing the dish very clean with alcohol and water, used alternately, and wiping it thoroughly with a rubber-tipped glass rod. The total volume of washings should not exceed 15 Cc., of which not more than 5 Cc. should be alcohol. Add 25 Cc. of chloroform-alcohol mixture (2 volumes of chloroform : 1 volume of alcohol) to the contents of the separating funnel, followed by a cold saturated solution of sodium hydrogen carbonate. This latter should be added almost drop by drop, till complete alkalinity is ensured, but an undue excess must be avoided. An excess tends to encourage emulsification and also unduly dilutes the aqueous layer to be extracted. Shake the separating funnel well and steadily for not less than 3 minutes, then allow to stand. Separation into layers is generally very rapid. Run the lower layer into a flask, and repeat this extraction and separation, using the same volume of solvent and shaking for the same period. Four such extractions should always be made, but if there is any tendency to the formation of an emulsion a fifth extraction is desirable as a safeguard. The combined extracts are distilled, heating the flask on a water bath almost to dryness. Dissolve the residue in an appropriate measured quantity of N/10 sulphuric acid or a standard acid of approximately that strength (1 Cc. acid = 0.0300 Gm. morphine is very convenient), and titrate back with N/10 or N/20 sodium hydroxide solution. Lacmoid or cochineal are very suitable indicators.

Qualitative Examination of Titrated Liquid.—Add to the titrated liquid obtained as above a drop of acid in excess, then 1 Gm. of slaked lime. Allow the mixture to stand for a few minutes with occasional shaking, till the lacmoid has been thoroughly precipitated. Filter and acidify the filtrate slightly with hydrochloric acid. Evaporate on the water bath to a convenient volume, and apply any desired qualitative tests for the presence of morphine.

REMARKS ON THE FOREGOING METHOD.

Calculation of Results.—The calculation of results is made strictly according to the stoichiometrical relations involved. It is not necessary to adhere strictly to the quantities and aliquot parts laid down above, but they are those which experience has shown to be most often convenient. There are no conventional "corrections" to be applied, as in most standard methods for the assay of opium, so that much greater flexibility of detail is possible.

Possible Objections to the Method.—The most obvious objection that can be raised is to the repeated taking of aliquot parts as involving an increasing possible error. Of course, the measurements thus involved must be made with due care, and properly graduated vessels must be used. Under such conditions even the theoretical errors involved become insignificant. In practice, the results obtained are excellent, as shown under the heading "Experimental Data."

The chemical accuracy of every step has been shown in Part I, so that these favorable results cannot be wholly attributed to a "balancing of errors."

Special Precautions.—Experience has shown that certain precautions are necessary to ensure complete extraction of morphine and to avoid the formation of emulsions during the process.

1. The volume of the aqueous solution to be extracted should be somewhat less than that of the chloroform-alcohol mixture with which it is to be shaken.

2. The amount of inorganic salts in this solution should be as small as possible. For this reason the addition of acids and alkalis following the precipitation of the barium sulphate should be made as sparingly as possible.

3. The evaporation should be conducted as rapidly as possible. Some Chinese pills appear to yield a soluble substance which, on oxidation, encourages the formation of emulsions. No serious amount of this is formed if the evaporation is conducted quickly, but exposure of a large surface of liquid during slow evaporation is very prejudicial. The use of a platinum evaporating dish is, therefore, very advantageous.

4. Should the pills to be examined contain soap, sulphates, or other substances that react with barium hydroxide, special measures must be taken. The lines on which such pills may be treated are indicated in Experiment 30.

The Action of Barium Hydroxide Solution in Promoting Rapid Filtration.—The following substances have at different times been recognized as probably causing the slow filtration of aqueous extracts obtained from pills: soluble starch, soap, gum tragacanth, gum acacia.

It is well known that half-saturation of a solution with barium hydroxide will precipitate starch. It has the same effect on gum tragacanth, as shown by Experiment 28. Soap must, of course, be treated with larger amounts of barium hydroxide. Gum acacia is not precipitated from solution by half-saturation with barium hydroxide, but after such treatment the solution filters more rapidly. The excipients employed by native Chinese pharmacists, whatever they may be, usually give very slow-filtering solutions when extracted with water, but they always respond readily to treatment with barium hydroxide.

EXPERIMENTAL DATA ON THE ANALYSIS OF MORPHINE PILLS.

Determination of Morphine Mixed with a Bread-Crumb Pill Base. Experiment 23.[2]—Crystallized morphine (0.6000 Gm.) dissolved in sulphuric acid, was mixed with dry bread crumbs (5.4 Gm.). The mixture was examined in the manner detailed above. Five extractions were made.

Titration results:

Total acid used = 15.20 Cc.
Acid equivalent to the alkali = 6.25 Cc.
Acid equivalent to the morphine = 8.95 Cc.
Weight of morphine calculated from titration = 0.2685 Gm.

Since the amount titrated was $^{10}/_{22}$ of the whole, 6 Gm. of pill mass was thus found to contain 0.5907 Gm. of alkaloid or 9.84 per cent. [Amount actually present = 10 per cent.]

Determination of Morphine when Mixed with a Chinese Pill Base. Experiment 24.—The material upon which this experiment was made was 0.6000 Gm. of morphine mixed with fragments of Chinese pill (5.4 Gm.) known to be itself free from morphine.

The method of operation was the same as in Experiment 23.

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[2] The experiments in this communication are numbered consecutively with those in Part I.

Titration results:

Total acid used	= 16.50	Cc.
Acid equivalent to the alkali	= 7.41	Cc.
Acid equivalent to the morphine	= 9.09	Cc.
Weight of morphine calculated from titration	= 0.2727	Gm.

Equivalent to 0.0614 Gm. of morphine in the 6 Gm. of pill taken or 9.99 per cent. [Amount actually present 10 per cent.]

Experiment 25.—Only 0.0600 Gm. of morphine was used in this experiment, the weight being made up to 6 Gm. by the addition of Chinese pills.

The determination was conducted exactly in the same way as in Experiments 23 and 24, except that only four extractions were made with the chloroform-alcohol mixture.

Titration results

Total acid used	= 10.30	Cc.
Acid equivalent to the alkali	= 9.37	Cc.
Acid equivalent to the morphine	= 0.93	Cc.
Weight of morphine found by titration	= 0.2799	Gm.

Equivalent to 0.0614 Gm. of morphine in the 6 Gm. of pill taken or 1.02 per cent. [Amount actually present 1 per cent.]

Determination of Morphine when Present as Tartrate and Mixed with a Chinese Pill Mass. Experiment 26.—Crystallized morphine (0.3000 Gm.) was dissolved in a little tartaric acid solution. Chinese pill mass (5.7 Gm.) was mixed with this, and the analysis of this mixture was carried on as in Experiment 25.

Titration results:

Total acid used	= 15.00	Cc.
Acid equivalent to the alkali	= 10.55	Cc.
Acid equivalent to the morphine	= 4.45	Cc.
Weight of morphine found by titration	= 0.1335	Gm.

Equivalent to 0.2937 Gm. of morphine in the 6 Gm. of pill taken or 4.89 per cent. [Amount actually present 5 per cent.]

Demonstration that Percentages Found Above are not Increased by Inclusion of Other Bases with Morphine. Experiment 27.—This was a "blank" experiment, in which no pill mass was mixed with the morphine. Crystallized morphine (0.6000 Gm.) was dissolved in a little dilute sulphuric acid. The solution was treated as were the pill-mixtures in Experiments 25 and 26.

Titration results:

Total acid used	= 25.00	Cc.
Acid equivalent to the alkali	= 15.90	Cc.
Acid equivalent to the morphine	= 9.10	Cc.
Weight of morphine found by titration	= 0.2730	Gm.

Equivalent to 0.6006 Gm. in the original solution. [Amount actually present 0.6000 Gm.]

The Action of Barium Hydroxide on Constituents of Pills not Present in Previous Determinations. Experiment 28. Gum Tragacanth.—A strong solution of gum tragacanth was prepared which was, alone, quite unfilterable. To it was added its own volume of a cold saturated solution of barium hydroxide. The gum was precipitated and the liquid filtered readily.

Experiment 29.—Gum Acacia.—An aqueous solution (10 per cent.) of this gum was prepared. Two portions of 50 Cc. each were taken.

Portion A was diluted to 100 Cc. with water.

Portion B was diluted to 100 Cc. with a cold saturated solution of barium hydroxide. No precipitate formed. The two solutions were filtered side by side under as nearly as possible the same conditions. It was at once evident that B filtered more rapidly than A. When 46 Cc. of filtrate had been collected from B, only 26 Cc. had been collected from A.

A further test was made by dissolving 6 Gm. of gum acacia in water and treating it entirely as though a morphine determination were being made. It was submitted to all the treatment detailed under Experiment 23. There was no tendency to form an emulsion with the chloroform-alcohol mixture.

Experiment 30. Soap.—The presence of soap, or some such constituent of a pill as would react chemically with barium hydroxide, calls for slightly modified treatment. The nature of the modifications will generally be obvious, but the following is a fair example:

About 6 Gm. of laundry soap was dissolved in 25 Cc. of water. To this was added 25 Cc. of cold saturated barium hydroxide solution, followed by 5 Gm. of barium hydroxide dissolved in 10 Cc. of hot water. The resulting mixture was cooled, then diluted to 100 Cc. with more cold saturated barium hydroxide solution. After thorough mixing it was filtered. Examination of the filtrate showed that barium hydroxide was present in such excess as to insure that any morphine originally mixed with the soap would be held in solution. Although a little fatty acid was liberated on the addition of hydrochloric acid, its presence would not interfere with the subsequent operations. If, in transferring the concentrated solution to the separating funnel, the use of alcohol were avoided, this fatty acid could be removed sufficiently by a single extraction with chloroform before the addition of sodium bicarbonate and the liberation of morphine.

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ADVANCES IN INDUSTRIAL ORGANIC CHEMISTRY SINCE THE BEGINNING OF THE WAR.[1]

By Samuel P. Sadtler, Ph.D.

Many ordinarily intelligent people with no special acquaintance with scientific matters will confess to having had the belief that the United States had no established chemical industries at the outbreak of the present great world war, or if we had any, they did not cover the field of what is known as organic chemistry. Organic chemistry was to them the field of coaltar dyes and synthetic medicines and was not this the peculiar and exclusive domain of the German chemical manufacturer? We rather think that this expresses the actual knowledge on the subject on the part of our non-scientific newspaper and magazine writers at the outbreak of the war.

However, the elements which go to favor the establishing of a chemical industry are a wealth of raw materials and a market for the manufactured product, and with these, the coöperation of intelligent chemical effort and capital. All four of these elements existed in the United States and the result of their coöperation had already been quite effective long before the beginning of the war in giving us flourishing chemical industries based upon organic raw materials and involving applications of organic chemistry. When we recall the great wealth of this country in petroleum and asphalt, in all varieties of coal, in vegetable and animal oils and fats, in cereals of all kinds and in fibers of indispensable character, we would be surprised if flourishing chemical industries had not been established.

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[1] Prepared by request for the 4th National Exposition of Chemical Industries, New York, Sept., 1918.

Let us briefly view some of these industrial organic developments as they existed prior to 1914.

The American petroleum industry easily ranked as the first in importance in supplying the world with the various products of mineral oil.

Of a total annual world's production in 1914 of over 400,000,000 barrels, the United States produced 265,762,000 barrels, or just about two thirds, while Russia, the next in rank, produced 67,000,000 barrels, or 16.7 per cent. of the total amount.

But it is not only the raw material production that is to be considered. By far the larger proportion of this crude oil was refined in the United States and from it were made gasoline, kerosene, lubricating oils in great variety, paraffin and paraffin candles, vaseline and similar products. These products were not alone for the American market but went all over the world.

We also had a great and well-developed industry in the extraction, refining and working up of vegetable and animal fats and oils. A peculiarly American industry was the cotton-seed oil and cake industry. Hundreds of mills throughout our Southern States were devoted to the crushing of the seed and the preparation of the cake, while the refining of the oil and the making of the finest edible products was carried out in large plants. The enormous production of lard and lard oil by our great packing companies and the preparation of oleo oil for foreign shipment was also an important and well-established American industry. As a side product, the extraction and refining of glycerin had also become well established and the American soap industry was also well developed and a large export business already inaugurated.

The utilization of linseed oil for paint oils and in the manufacture of linoleum and oilcloth had also reached a high development at the hands of American technologists.

The great naval stores industries, involving the production and utilization of American turpentine and rosin, had also been well developed and many minor chemical industries based upon them. America was also one of the largest consumers in the world of rubber and, thanks to the manufacture of all classes of rubber and waterproofed goods and to the utilization for automobile tires, the working of rubber had been extensively developed.

The refining of sugar, in part produced in the United States and the neighboring West India Islands and in part from imported European raw beet-sugar, had become an extensive industry with the most modern of plant equipment and under scientific chemical control.

As America is in large degree the granary of the world in its production of cereal foods, we had large chemical industries already occupied with the preparation of the special classes of food products of cereal origin. One of the best instances of a distinctively American industry developed from American material is the corn products industry. From the Maize or Indian corn is produced corn starch for food purposes and for technical purposes, glucose or commercial dextrose, corn or maize oil and commercial dextrines. This industry has been developed from a distinctively American cereal and on lines quite peculiar to it as an industry of American growth.

Turning to the textile industries, we have as an American production, one of the world's most useful fibers, viz., the cotton fiber. I have already referred to its peculiar byproduct, the cotton seed and its utilization. However, we have many important industries utilizing the cotton fiber in which its bleaching, dyeing and other treatment is controlled by accurate chemical knowledge and practice.

The textile industries using wool and silk as well as cotton have, moreover, attained a high development in the United States, and the chemical side, involving the cleansing and after treatment of the fibers, had been thoroughly worked out.

The products of destruction distillation remain to be spoken of. Our American wood distillation industry will be specially presented by another speaker during this exposition and so I will pass this by. Coal distillation for gas-making had been practiced by the most accurate scientific methods and great varieties of special gas-making processes had been developed. It will be remembered that the Lowe water-gas process was an American invention which has been copied and adapted since in various other countries. However, we were slow to discard the old wasteful beehive oven for coking of coal for byproduct ovens, which collect the valuable residuals including gas, tar and ammonia. The production of coaltar crude ingredients was therefore only moderately developed and of what we term the "intermediates" for the color industry hardly at all.

An American dye-color industry, using imported intermediates, therefore existed, but it existed under difficulty and played but a subordinate part in supplying the American market with the dyes required for our textile industries.

This brief survey shows that it is a great mistake to assume that there were no organic chemical industries existing in this country in 1914 at the outbreak of the war. Nevertheless, the general public knew little of the chemist and his actual or potential value to industry or commerce. Capital, which frequently made large investments in mining and similar enterprises, many of which were largely speculative, had not made the acquaintance of the chemist to any notable extent, perhaps because the language of chemical reactions used by him was something foreign to the experience or training, of the capitalist and hence distrusted. The war came and we soon learned how great a disturbance such a great war could be to the world's commerce, in which the United States played a vitally important part. We also learned promptly how chemical industries were the foundation stones for this great commerce. It soon developed that war in its modern form was based upon the chemical activity and scientific development of a country and then the chemist began, as has been repeatedly said, to come into his own.

Our special topic therefore is to briefly note how our American chemical industries, and in particular those involving organic chemistry, have responded to this war impulse and demand in the four years that have elapsed since the beginning of the war period in 1914.

Our petroleum industry, which we have shown was already in a highly developed state, had important problems at once presented to it. Great as was our refining capacity, it was utterly inadequate to produce in normal course the quantities of gasoline that were required. Besides the growing automobile consumption, the war demands for motor trucks and for aëroplane and tractor engines came as an added load on the industry. Because of the demoralization of the Russian oil production and the German occupation of Roumania, the whole gasoline supply for the allied nations has to come from America. To meet this demand we have in addition to what may be called "straight refinery" gasoline, blended "casing-head" gasoline and "cracked" gasoline. Under the pressure of the great demand, large quantities of volatile hydrocarbons are washed out by suitable solvents or condensed out of natural gas and then blended with heavy naphtha to bring down the gravity to a proper average. Such a gasoline will necessarily have a wide volatility range but is available for most uses that the normal refinery gasoline is. Most of the areas producing natural gas are available for this gasoline extraction but it has developed particularly in West Virginia, in Oklahoma and in California. It is furnishing a rapidly increasing amount of gasoline yearly. The third source of gasoline mentioned is from special cracking processes, and it is this class of processes which have been attracting the most interest and giving the greatest promise of large results. The whole subject was discussed from a theoretical and historical point of view in Bulletin 114 of the Bureau of Mines by Rittman, Dutton and Dean. Since the date of that publication in 1916, a great deal additional has been published in the Journals and much has been done in a practical way. The Burton process, adopted by the Standard Oil Co., is now in operation on a large scale in several of the largest refineries of that company; the Rittman process has been tried on a working scale, although not yet developed in a final form for large scale production; the McAfee process of decomposition in the presence of aluminum chloride as catalyst has been developed by the Gulf Refining Co. and the Snelling process has also been brought forward. That heavy petroleum oils can be cracked so as to produce much light oil or gasoline is beyond question, but the problem is to avoid the production of large proportions of unsaturated compounds which require acid treatment in the product. McAfee claims to avoid this production of unsaturated compounds and that his gasoline requires no acid treatment, but the success of his process is conditioned on the economical recovery of the anhydrous aluminum chloride available for use. Enormous quantities of other special petroleum products have also been called for by reason of war demands, such as high-grade lubricating oils. I had brought to me for testing some time back a "recoil oil," required by the government for use with heavy guns, that with a high viscosity had to stand a cold test of — 5° F. (— 20° C.).

Then the demands of the English and the U. S. Navy for fuel oil has drawn upon the Mexican oil fields as well as those of Louisiana and Texas and pushed production to the maximum.

Meanwhile a new raw material has been brought to notice that is capable of adding enormously to our available petroleum supplies in the oil shales of western Colorado and eastern Utah, the deposits also being found to some extent in Nevada, Wyoming and Montana. These shales readily yield by distillation a crude oil capable of furnishing gasoline, kerosene and paraffin and in addition large amounts of ammonia, so that sulphate of ammonia may be obtained as a by-product. In Bulletin 691 B. of the U. S. Geological Survey, D. E. Winchester has described this occurrence and gives records of distillation. These shales are said to be like the Scotch shales but richer in oil. With the gradual exhaustion of the oil fields they will prove a welcome addition.

The vegetable and animal oil markets have been greatly affected by the war, and the industries based upon them have been changed in a revolutionary way in many cases. The first cause may be said to have been the export embargo established by Great Britain upon all glycerine-containing oils with the beginning of the war. Following this came a shortage in the cotton-seed crop in 1915 and the introduction of soya bean culture in the South. As the refined cotton-seed oil took more and more the position of an edible oil, commanding corresponding higher prices, the soya bean oil took its place for industrial uses, for soap and paint manufacturers and as a constituent of compound lard and oleomargarine. The soya bean cake has also been readily taken up for stock feed and for fertilizer. The soya bean contains more protein than either cotton seed or peanuts, as much fat as cotton seed, and only one fourth as much fiber as cotton seed or peanuts.

It has a lower iodine number than linseed oil and is slow in drying, so that it can not completely replace linseed oil in the paint industry, but can be admixed with it. Besides the production in the South, which according to government reports in the year 1917 was from 531,000 acres, we have had an enormous development of the soya bean oil importations as the following figures will show. Importation for year 1914, 12½ million pounds; for 1917, 264.9 million pounds, and for 1918, 336,824,646 pounds.

Most of this coming from Manchuria enters Seattle and other Pacific coast ports. All available storage facilities at Seattle and other coast points have been overtaxed in the handling of this supply.

Another great development in oil supplies has come from the greatly increased production of peanut oil. This has come to the fore as a salad oil and for soap making. The crop in the United States rose from 3½ million bushels before the war to 40 million bushels in 1916 already. For 1917, the government reports shows that 3,277,000 acres were devoted to its culture in the South, and for the year of 1918 it is estimated that in the State of Texas alone 3,000,000 acres will be devoted to it. The importations have also increased sixfold since 1914, now amounting to over eight million gallons.

A year ago we had no castor-beans grown in this country to speak of—today we have at government instigation hundreds of thousands of acres devoted to it in Florida and elsewhere and the product contracted for by the government. As illustrating the greatly increased demand for oils capable of yielding food products we may also note the remarkable growth in the cocoanut oil and copra importations. In 1914 the importations of cocoanut oil amounted to 74,386,213 lbs.; in 1918 it had grown to 289,194,853 lbs.; of copra for the expressing of cocoanut oil we imported 45,437,155 lbs. in 1914, and in 1918, 486,996,112 lbs. Similar changes have taken place in the fish-oil markets with the decrease in the menhaden catch, due to the commandeering of fishing boats and scarcity of men to man them. Through our Pacific ports chiefly are imported quantities of dog-fish, halibut, salmon, sardine, shark, tuna-fish, candle-fish and walrus oils, largely new to the market, while whale oil, seal oil and porpoise oils are again appearing in large quantities. These fish oils have moreover an added value as sources of supply since the general application of the hydrogenation process, whereby they can be changed into hardened fats without offensive odor and of the greatest value as soap stock and for glycerine production.

With regard to the increased production of glycerine because of the war demand, I have no figures, but the demand has been so very great that the use of glycerine in pharmaceutical preparations has been discouraged in order to conserve the glycerine for nitroglycerine production, and for export to our allies, 21 million pounds having been exported in 1918.

In the field of essential oils there are a few items of interest to note. With the study of wood turpentines as distinguished from gum turpentine, it has been recognized that spruce wood turpentine, now a waste product of the sulphite process of making paper-pulp, has a peculiar composition. It consists largely of one aromatic hydrocarbon, cymene (iso-propyl-methyl-benzene). On subjecting this to the Friedel and Crafts reaction with aluminum chloride in the presence of an excess of benzene, toluene and cumene (propyl-benzene) are formed. The toluene is readily converted into T. N. T. (tri-nitro-toluene) and the cumene may be oxidized directly into benzoic acid. The work, as reported in the *Journal of Ind. and*

Eng. Chemistry for May, 1918, is still in a purely experimental stage but it has much promise.

One of the newer uses of essential oils which has particularly stimulated the production in the last few years of pine oil in the South is for the ore flotation process. The concentration of both copper and zinc ores in the United States as in other parts of the world is now effected by agitating the finely pulverized ore with water in the presence of a small quantity of oil. White fatty oils, mineral oils, coal-tar and wood-tar creosotes have been used, certain essential oils have been found to be specially adapted for this treatment. In this country pine oils, both steam distilled and destructively distilled have been especially used and quite an industry in these oils has developed. The magnitude of our copper and zinc production is such that although the amount of oil used in this flotation process is relatively small (less than 1 per cent. on the ore), the aggregate consumption of oil is very large.

The war demand has greatly increased the call for rubber goods of all kinds, especially automobile tires, and consequently the consumption of crude rubber has grown rapidly. The importations of rubber in 1914 amounted to 132 million lbs., but grew to 390 million lbs. in 1918. The exports of rubber boots and shoes amounted to $1,113,495 for 1914 and to $5,774,341 in 1918; the automobile tire exports were valued at $4,068,639 in 1914 and at $15,128,294 in 1918.

In this connection reference may be made to the greatly increased demand for organic solvents and the work done to meet this demand. The most important work of this kind is probably the production of acetone and similar solvents from the Pacific Coast kelp by the Hercules Powder Co., and this fortunately we will have specially presented at this time in a paper dealing fully with the subject.

Another promising line is the manufacture of amyl acetate from petroleum pentane recently described in the *Journal of Ind. and Eng. Chemistry* for July, 1918. This work has been carried out at the Mellon Institute in Pittsburgh, Pa. The use of these organic solvents is manifold, but we may note the extensive use of pyroxyline solvents and the greatly increased use of lacquers of this description in the last four years. From aeroplane-wing dope to artificial leather we have a variety of utilizations and some of these have grown to extensive industries within the past few years.

Closely allied to this industry, is the artificial silk industry, one variety of which is made from a nitrated cotton or pyroxylin. Besides this variety we have the viscose variety, the cellulose acetate, and the cuprammonium artificial silk. The development of these products has been very great in this country in recent years, both for films and for artificial silk as a fiber increasingly used in the textile trade.

Industrial alcohol production has developed greatly in the past few years and numerous new plants have been established for its production from a variety of sources. Much attention has been given to a revival of the Classen process for hydrolizing the cellulose of sawdust and fermenting the sugar produced therefrom. I have no reliable information, however, as to whether the difficulties which developed when it was first tried in this country some years age have been sufficiently overcome to make it a dependable manufacturing process, although it has attracted much newspaper attention. More reliable are the processes based upon the use of low grade molasses and cereals of various kinds and a large production, at present taken over by the munition manufacturers, has been the result.

In addition to this direct war use, much alcohol is made for denaturing and use in the manufacture of pharmaceutical products. Some 27 denaturing formulas have been allowed by the U. S. Internal Revenue office and these adapt it for use in a wide variety of cases where tax-paid pure alcohol is inadmissable on account of its cost. This form of utilization is not of temporary character, as is the use in munitions manufacture, but is destined to grow and require an increasing amount of alcohol properly denatured.

We come now to the industry which may be said to be the touchstone of our ability to achieve results under difficult conditions, when confronted with an imperative necessity, viz., the building up on American soil from American raw materials with American capital and American chemical effort an independent dyestuff industry. In speaking of the conditions in the United States in 1914, I said that we had a small dyestuff industry, working under trade difficulties, for the most part with imported intermediates. There were, to be exact, five manufacturers, large and small, of dyestuffs in 1914. The tariff census of coal-tar products, as reported for 1917, shows that there were at that time in the United States 81 establishments engaged in the manufacture of coal tar dyes and 117 firms manufacturing intermediates. While these figures are striking and can not fail to arrest attention, it is only when we look more fully into the details that we get an adequate understanding of the great industrial achievement that has been wrought in the last four years.

First as to our dependence upon foreign sources, chiefly German, for our dyestuffs at the beginning of the war in 1914. We were then making in this country a bare one fifth of our needs out of foreign materials and had neither crudes or intermediates to speak of. Dye imports from Germany in 1914 were valued at $5,965,537; in 1916 they were valued at $849, in 1917 at $464,499, and in 1918 at $3,048. The relatively large amount for 1917 represents shipments held at first in Great Britain but released later on appeal. Do we still import any dyestuffs? Yes. There are two reasons for importing from Switzerland and Great Britain mainly, certain dye colors.

The new American dye industry.did not at once attempt to duplicate the 900 or more supposedly distinct synthetic dyes of the German dealers, but took up the most important classes and produced a moderate number of representative dyes, covering as far as possible the coloring or tinctorial needs of the textile trade and some of the finer shades are still missing, hence the Swiss importations.

The other reason and perhaps the more important one was that Congress, in the enactment of our present tariff law, cut off the advalorem duty on indigo and alizarine products, which caused manufacturers to leave the production of these very important products until they had covered the need in the other groups more fully.

However, synthetic indigo of American manufacture is already on the market and there will be three sources of supply for it in 1918, one of which promises to supply at least one half of what the American trade will need for the year. Similarly artificial alizarine of American manufacture, made in Brooklyn, in fact, will be available in large quantities from this time on.

Meanwhile approximately three fourths of the dyestuffs needed are being produced and some colors in such quantity that an export trade has been started. Let us note that for the year ending June, 1916, the exports of all varieties of dyestuffs—aniline dyes, logwood extract and all other totalled $5,102,002 in value, but the bulk of these were vegetable colors including logwood extract. In 1917, the valuation of the exports had leaped to $11,709,287, with an increasing amount of such colors as sulphur black and the simpler aniline colors. In 1918, and this shows the quality as well as quantity of development, the total exports of dyestuffs were valued at $16,921,888. Of this, total aniline colors make $7,298,298, logwood extract $2.339,480 and all other $7,284,110. It will be noted that the aniline colors alone exceeded in value the dyestuff importations from Germany in 1914.

But the main market for which these dyes are being made, and for the permanent relief of which a great American industry has been created is the United States market and the way in which this has been done, is deserving of a more detailed examination.

With the shutting off of the foreign sources of supply in 1914, not only was the need of an American dye industry made clear, but the manufacture of munitions and the filling of foreign orders for the same called for coal-tar products. The manufacture of phenol, of picric acid and of tri-nitro-toluol all demanded an immediate supply of coal-tar crudes. So the gas works, the byproduct coke ovens and the tar distillers all united to increased and intensive production. I need only refer to the lists of such great companies as the Semet-Solvay Co., the United Gas Improvement Co., and the Barrett Manufacturing Co. as illustrating the achievements in this production of coal-tar crudes. For the increased production of benzol and toluol the Ordnance Division of the War Department has also started to establish plants for byproduct coal distillation because of its special needs. However for the dyestuff manufacture we go from the coal-tar crudes to the "intermediates." Some of these require very special apparatus for their manufacture and it was these that had not been made in this country prior to 1914. Our chemical apparatus manufacturers (several of whom are very well represented in this exposition) responded to the call for this apparatus and gradually these important products mostly new to American trade were supplied. The tariff census of 1917 states that the production of intermediates for that year was contributed to by 117 firms and that the production amounted to 322,650,531 lbs. valued at $106,942,918. These figures, however, involve considerable duplications because of the use of some as starting-point in making others. That the amounts of many are very large is, however, shown by the statement published by the National Aniline and Chemical Co. that their Marcus Hook works has a producing capacity of aniline oil five times as great as the total consumption in this country prior to the war, and that this company is now the largest producer of aniline oil in the world.

The coöperation of producers of coal tar and its "crudes" with the manufacturers of "intermediates" and the dyestuff manufacturers was obviously a very desirable thing in the building up of the new industry and establishing it on a firm foundation. Such cooperation has been planned in the organization of our largest American dye manufacturing company. As they announce in their statement, "the various plants of this company are engaged in producing everything necessary for dye manufacturing, commencing with the basic raw materials or "crudes" derived directly from coal, with the acids and other chemicals converting these crudes into dye "intermediates," which are also used for explosives, and the manufacture finally of the several classes of dyes demanded by the industries.

In this combination we have the Semet-Solvay Co., and the Barrett Manufacturing Co., the General Chemical Co., the Benzol Products Co. furnishing "crudes" and "intermediates," and the Schoellkopf Aniline and Chemical Works, Buffalo, N. Y., the W. Beckers Aniline and Chemical Works, Brooklyn, N. Y., the Century Color Corporation, Nutley, N. J., and the Standard Aniline Products Co., Wappinger's Falls, N. Y., producing "intermediates" and finished "dye colors." All the raw materials are the product of American factories as well as the finished products.

The "intermediates" listed by the National Aniline and Chemical Co. amount to 58 distinct substances and the dyes named to nearly two hundred.

Other of our American color manufacturers have additional distinctive dye-colors as well as many the equivalents of those in the list referred to. Truly a satisfactory showing for what is practically a newly created industry at the end of the fourth year since the start was made.

The Tariff Census of 1917 before referred to makes the following statement:

"The annual production was reported for the following groups of products made in whole or in part from material derived from coal tar; 45,977,246 pounds of dyes valued at $57,796,027; 5,092,558 pounds of color lakes valued at $2,764,064; 2,236,161 pounds of medicinal chemicals valued at $5,560,237; 779,416 pounds of flavors valued at $1,862,456; 263,068 pounds of photographic chemicals valued at $602,281; and 19,545 pounds of perfume material valued at $125,960."

Of course, the manufacture of munitions, begun on allied account and continued later by the Ordnance Bureau on our own account, means the production of numerous organic compounds on a scale totally beyond any previous experience—picric acid, tri-nitro-toluol, nitro-cellulose and nitro-glycerine for smokeless powder, fulminate powders and other preparations are manufactured by tons, but as this is a war industry and not one that will continue we have omitted it from our discussion.

In conclusion, what is the outlook for industrial organic chemistry in the immediate future in this country? I would say that it is most encouraging. The exigencies of the war in Europe have caused a widespread search for independent sources of raw materials to be made and with very satisfactory results in many cases. Our large corporations have established research laboratories with the best up-to-date equipment and have planned real and thoroughgoing research in a broad intelligent spirit, which does not ask for hasty results but emphasizes the wish for thoroughness. Our government has recognized in a very satisfactory way its need of chemical service and has thus publicly endorsed the fundamental importance of the chemist in industrial achievement. Capital has come forward willingly in support of properly planned chemical undertakings and thus made the establishment of new industries possible in a way far beyond what had been possible before the war period. Lastly, the disturbed condition of all European trade relations has made it possible for the United States to inaugurate very promising export business in quarters not previously practical or under conditions distinctly unfavorable.

These new achievements we have every reason to expect to continue in the future and no doubt with added momentum.

SURGEON'S LIQUID ADHESIVE.

By E. Fullerton Cook, Ph.M.

The usual methods followed today by the surgeon for fastening a bandage or dressing requires a strip of adhesive plaster, a safety pin, or the splitting and tearing of the end of the bandage and tieing with the string so made. Even when carefully applied, especially when a head bandage or a spiral reverse is required, these methods of fastening often permit the bandage to slip and loosen. Furthermore, the cost today of adhesive plaster has become almost prohibitive and frequently it is difficult and painful to remove the plaster.

These conditions suggested the use of a water-soluble, liquid adhesive for fastening bandages and the following is offered as an inexpensive and practical formula, readily prepared by any pharmacist or hospital dispensary.

Surgeon's Liquid Adhesive (Cook).

Liquid glue (a commercial glue, such as Dennison's, is readily obtainable in bulk)	1,000 Gm.
Zinc oxide	200 Gm.
Oil of eucalyptus	15 mils.
Oil of peppermint	15 mils.

Mix and rub to a smooth paste.

This paste may now be used by the surgeon with a small stiff brush, like ordinary glue, but when used by this method, the stock dries in the jar in a few days, and therefore it is preferable to pour it into a collapsible tube of the "eye-point" type, where it can be kept without drying, and from which it may easily be pressed when wanted, and applied with the aid of the eye-point, wherever desired. In addition to neatly and quickly fastening the end of the bandage, one of the advantageous applications of this adhesive may be in fastening the overlapping edges of a head, hand, chest, or spiral reverse bandage, absolutely preventing its slipping.

It is also possible to use this adhesive in the application of a small protective dressing in vaccination or on a small cut or burn, by selecting a piece of paraffined gauze or other dressing material of suitable size, applying the adhesive on all four edges and then holding it in place for a few moments. The dressing will be held firmly and when its removal is desired, a little warm water will release it without pain.

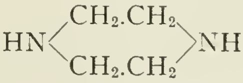
The insertion of the adhesive in a collapsible tube would seem to be the most practicable method for its use by a physician in office practice, but the adhesive can be made up in quantity in a hospital, or dispensary, and a special syringe-like applicator, with a screw-plunger and sharp nozzle point, be used by the surgeon, in its application. In either of these devices, should the adhesive harden or dry at the outlet, a few moments of immersion in warm water will open it.

Pharmaceutical Laboratory,
Philadelphia College of Pharmacy.

THE PREPARATION OF PIPERAZINE.[1]

By David S. Pratt and Charles O. Young.

Piperazine, or diethylenediamine,



$$HN\left\langle\begin{matrix}CH_2.CH_2\\CH_2.CH_2\end{matrix}\right\rangle NH$$

has been used extensively in cases of gout and arthritis with such success that its absence from the market justified a rather extended search for methods which might be employed in preparing it.[2] Several important modifications of procedure, as disclosed in the patent literature, have been found which it is believed will materially aid anyone attempting to prepare piperazine commercially.

The ease with which ethylene bromide condenses with aniline to form dyphenyl piperazine appears to offer the best starting point in the preparation. This reaction can be carried out under proper conditions to give practically a theoretical yield suitable without further purification for the purpose. Unfortunately, it does not seem possible to replace the two phenyl radicals with hydrogen to give piperazine directly.

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[1] Contribution from the Mellon Institute of Industrial Research, University of Pittsburgh. Reprinted from the *Journal of the American Chemical Society*.

[2] The value of piperazine in certain types of nephritis has been studied extensively by Dr. E. E. Mayer, who will report his results in the near future.

However, nitrous acid reacts with dyphenyl piperazine, and this derivative can be hydrolyzed. According to German patent No. 60,547, boiling with alkalies accomplishes the desired result.

The conversion of dyphenyl piperazine into its dinitroso derivative involves difficulties which are not disclosed in this or other patents. The addition of sodium nitrite to a suspension of diphenyl piperazine in acidulated cold water results in the formation of sticky, green tars which give no traces of piperazine on boiling with aqueous or alcoholic alkali. Many fruitless attempts to carry out this step in such a way as to avoid decomposition of the desired product were made. It was eventually found possible to obtain good yields of the dinitroso derivative by suspending finely ground diphenyl piperazine in ice-cold conc. hydrochloric acid and adding slowly a saturated aqueous solution of sodium nitrite. The suspension should be stirred vigorously throughout, and the nitrite solution should be added by means of a tube reaching to the bottom of the container. The solution turns red immediately and insoluble diphenyl piperazine is rapidly converted into the hydrochloride of dinitrosodiphenyl piperazine which remains in suspension as a golden-orange precipitate, quite stable while moist.

It may be removed by filtration and washed with cold water without undergoing serious decomposition. The amount of nitrite necessary is only slightly greater than theoretical, and yields are excellent. The use of conc. hydrochloric acid instead of dil. acid is vital. Before this factor was determined, all attempts to prepare the desired base were failures.

Dinitrosodiphenyl piperazine may be hydrolyzed by boiling with alcoholic potash to give free piperazine and nitrosophenol.[3] If this method is employed, the alcohol is removed and piperazine obtained by distillation with superheated steam. We have found low yields rather general, and considerable difficulty in avoiding volatile colored by-products.

Aromatic nitroso amines combine with sodium bisulphite[4] to give sulphonic acid derivatives which readily rearrange with loss of the amine group and hydrolysis. This reaction has been applied[5] to dinitrosodiphenyl piperazine. When these specifications are carried out as outlined, one obtains considerable amounts of ammonia, representing loss of piperazine, and more or less tar. These difficulties have been eliminated to a large extent and at the same time the hydrolysis has been simplified by discarding the addition and subsequent neutralization of a large excess of hydrochloric acid.

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[3] D. R. P. 60547.

[4] *Ibid.*, 65236.

[5] *Ibid.*, 74628.

The following procedure has proved satisfactory, and can be recommended, although it should be understood that experiments on a larger scale will doubtless disclose other advantageous modifications:

EXPERIMENTAL.

958 Gm. of ethylene bromide, 527 Gm. of aniline, and 575 Gm. of sodium carbonate (anhydrous) were thoroughly mixed and heated for 5–6 hours to gentle boiling in an oil bath using a reflux condenser. Stirring is decidedly beneficial and probably essential on a large scale, as the reaction product tends to cake. The presence of soda is necessary, otherwise ethylene bromide combines with aniline vigorously at about 95° to give diphenyl ethylene diamine and hydrobromic acid. The acid so freed unites with aniline to form the salt and liberates sufficient heat to cause charring.

The warm melt was extracted with hot water to remove sodium bromide which can be recovered readily and used as the source of bromine for ethylene bromide. The probability that ethylene chloride will be available soon in large amounts should be noted, and that it can be condensed with aniline similarly, using an autoclave to obtain the necessary temperature. The crude diphenyl piperazine is sufficiently pure for making its dinitroso derivative. Yields of from 90 to 95 per cent. are usually obtained.

547 Gm. of diphenyl piperazine, dried and powdered, was suspended in 2200 Cc. of cold conc. hydrochloric acid. With mechanical stirring a saturated solution containing 438 Gm. of sodium nitrite was slowly added through a tube reaching to the bottom of the acid. In this way, the loss of nitrous fumes is largely prevented and the formation of tar minimized. Cooling is necessary during the addition of nitrite. The resulting product was filtered off with suction and washed once with cold water. It is probably the hydrochloride of dinitrosodiphenyl piperazine, but no effort was made to analyze the material. It decomposes readily on drying, but is quite stable if kept moist.

The moist material was added to a 40 per cent. solution containing 1900 Gm. of sodium bisulphite, and the suspension warmed with stirring to about 80°. The reaction proceeds smoothly, giving a deep reddish orange solution and considerable suspended matter that was removed by filtration, and discarded. At this point D. R. P. 74,628 specifies the addition of a large excess of hydrochloric acid and heating to the boiling point before making alkaline with caustic soda. This results in the formation of ammonia due to decomposition, and of sodium chloride in large amounts.

We have omitted the treatment entirely without sacrificing the yield of piperazine. The reddish orange solution obtained above was made strongly alkaline with caustic soda and concentrated by distillation. Some ammonia was liberated at first, but the amount appeared negligible. The distillation was continued with superheated steam, the flask being immersed in an oil bath at 160°. Piperazine distilled over rapidly with the steam, and was caught in hydrochloric acid.

Micro tests were found convenient for determining when to stop the distillation. Traces of piperazine give very characteristic light yellow crystals with platinum chloride solution. These vary according to concentration, but in general are square or rectangular. A drop of the condensate on a microscopic slide was run into a drop of platinum chloride solution. The formation of a precipitate at once indicates that the distillation should be continued. Picric acid may be substituted for platinum chloride, but the resulting crystals are not so characteristic. When no precipitate formed at once, examination under the microscope readily revealed whether more than mere traces of piperazine were coming over.

Another reagent giving characteristic crystals with piperazine is bismuth potassium iodide. The reagent is made by adding enough nitric acid to dissolve suspended bismuth nitrate and sufficient potassium iodide to give a clear red solution. Slight traces of piperazine salt in faintly acid solution give very brilliantly colored garnet crystals with a drop of this reagent. The form of the crystals varies from compact prisms to the more usual clusters of feathery needles. The double salt is very insoluble and it is hoped that it will offer a means of determining piperazine quantitatively.

A less delicate, but very definite, micro test for piperazine is the formation of dinitroso piperazine. A drop containing piperazine is acidified with hydrochloric acid in excess and flowed into a drop of saturated sodium nitrate solution. Slight warming gives characteristic, thin, rhombic, colorless plates.

The aqueous distillate, distinctly acid with hydrochloric acid, gave 366 Gm. of piperazine hydrochloride on evaporation to dryness. The crude salt may be recrystallized from dil. alcohol or converted into the free base by distilling from sodium hydroxide.

Anhydrous piperazine is a solid with distinctly caustic properties. For this reason it has been marketed in the form of various salts and as the hydrate.

It is sincerely hoped that the information here given may result in the manufacture of this greatly needed medicinal preparation by some American laboratory.

A NOTE ON THE DECOMPOSITION OF SOLUTIONS OF HYDROCYANIC ACID.[1]

By W. Lewcock, B.Sc.

The characteristic decomposition which hydrocyanic acid undergoes whereby a dark brown precipitate is formed, was noted during the source of experiments on the production of the anhydrous gas on the large scale. One product of the decomposition is stated in the literature to be amino-malononitrile NH_2 $CH(ON)_2$—the reaction, however, is complex, and in this note attention is paid solely to the cause of the decomposition, on which light is hardly likely to be thrown by an enumeration of the various products of the decomposition.

As is known, on mixing a solution of sodium cyanide with a mineral acid, a yellow color appears as soon as any local excess of cyanide occurs, and if this excess is permanent, the decomposition proceeds with the separation of brown flocks. The reaction is so rapid at higher temperatures that in attempting to run a continuous flow plant, in which the gas was rapidly driven off by steam heating, it was essential always to keep the mixture acid, otherwise the outflow pipe soon became blocked with the deposit. The decomposition, which is due solely to excess of sodium cyanide, is thus prevented by having excess of acid present, but too much mineral acid effects the normal hydrolysis to ammonium formate, and it may be noted that on trying to dry the gas with pure sulphuric acid (96 per cent.) at 40° C., it is completely decomposed to ammonia and carbon monoxide. On running strong cyanide solution into leaden tanks, the liquid soon became filled with a brown precipitate; this at first appeared due to the polymerisation in question, but proved to be the result of interaction of a trace of sulphide in the cyanide with a film of lead oxide.

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[1] Reprinted from *The Pharmaceutical Journal and Pharmacist,* August, 1918. Communication to the British Pharmaceutical Conference for publication in the "Year Book of Pharmacy," 1918.

It is interesting to note that whereas sodium, carbonate dissolved in 30 per cent. sodium cyanide solution causes in time the separation of a slight brown precipitate, caustic soda has not the same effect. Presumably it is the hydrocyanic acid formed by hydrolysis which is thus decomposed; caustic soda represses the hydrolysis.

In order to investigate the influence of different compounds on hydrocyanic acid, solutions of the latter (7–8 per cent.) in water were made by running 30 per cent. cyanide solution into sulphuric acid (50–60 per cent.) which was slowly warmed up on a water bath, the gas evolved being condensed and collected in distilled water. The solution was then mixed with various reagents, and kept in sealed tubes in a dark cuboard. It was found that weak acids and salts of acid reaction had no influence in promoting the decomposition of the hydrocyanic acid; but the addition of bases such as caustic soda, potash, and ammonia resulted in the formation of soluble cyanides which brought about the reaction. Further, it was found that a large number of salts also caused the decomposition to proceed at varying rates. These include the soluble carbonates and bicarbonates, the alkali salts of nitrous acid, normal sodium phosphate, sodium sulphide, sodium sulphite, sodium ferrocyanide, and sodium acetate. Sodium sulphocyanide differs from sodium cyanide in that it does not affect the acid. Thus, salts of alkaline reaction are reactive, in all cases probably through the formation of a small quantity of cyanide, and this explains the variation in activity which such salts show. Borax, which is very active, is derived from an acid which is practically as weak as hydrocyanic acid itself.

Three quantitative experiments on the decomposition of 3.6 per cent. solutions of the acid at ordinary temperatures were carried out, and it was found that when the solution contained 1 per cent. of sodium cyanide, in two weeks 47.4 per cent. of the acid was decomposed; when it contained 0.75 per cent. $NaHCO_3$, in five weeks 1.4 per cent. was decomposed; and when it contained 1.4 per cent.

$NaNO_2$, 8.8 per cent. was decomposed in two weeks. In the last case it was found that decomposition had been hastened by the presence of a trace of alkali in the nitrite used. It was noted in these experiments that addition of hydrogen peroxide to the hydrocyanic acid oxydises it to cyanic acid, which on standing precipitates the white insoluble cyamelide.

Potential causes of the decomposition of the acid "spontaneously" on keeping are the action of light and air, the action of impurities contained in the water, the action of substances derived from the cork or rubber, the action of the materials used in preparation of the acid, and finally the action of substances derived from the glass vessel in which the acid is kept. In the case of solutions of strength varying from 2 per cent. to 7 per cent. it has not been noted that air or diffused light can effect decomposition appreciably, but a 4 per cent. solution exposed directly to strong light began to decompose after three months, although a similar solution was unchanged in the dark during that time. Of course, if the solution be exposed freely to the air it rapidly loses strength owing to the volatility of the hydrocyanic acid. In view of the above results on the influence of bicarbonates on the acid it is evidently best to avoid the use of tap water; although unless this is very hard the acid will only be affected very slowly, as experiments have proved. Neither cork nor rubber affects the stability of the acid, although both are able to absorb considerable quantities of it—thus it was noted that a rubber cork retained the characteristic smell for a considerable time after it had been thoroughly washed. Experiment showed that a red rubber cork cut in thin slices absorbed in two days 6.5 per cent. of its weight of hydrocyanic acid from a 7 per cent. solution—cork similarly absorbed in four days 2.34 per cent. of its weight. E. R. de Ong[2] has pointed out the absorption of the acid in soil. So far as the influence of the materials used in preparation of the acid is concerned, this could hardly be harmful; for, whether the gas is generated from the action of strong cyanide on sulphuric acid, or it is got by distilling a dilute acidified ferrocyanide solution, the sole impurity likely is acid, which, as is mentioned below, tends to keep the solution. Solutions were made by these two methods for comparison, and showed little difference; though actually that from ferrocyanide kept the better. If the hydrocyanic acid was purified from the trace of mineral acid by redistillation the solution commenced to decompose earlier.

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[2] *J. Agric. Res.*, 1917, 11, 421–436.

Finally, we have the influence of substance derived from the glass vessel in which the acid is stored, and there can be no glass vessel in which the acid is stored, and there can be no question that this is the main, if not the sole reason why dilute solutions of the acid cannot be kept indefinitely. The solution slowly dissolves from the glass sodium silicate, which in turn forms sodium cyanide, which is able to effect polymerisation of the remaining acid. This change proceeds very slowly, but it was shown fairly rapidly in the following experiment. Two samples of 8 per cent. hydrocyanic acid were sealed in tubes; to one of these had been added a quantity of clean, finely ground, soft glass. Both samples were shaken from day to day, and after two days the sample containing the glass was yellow, while after nine days it was dark brown, and a considerable deposit had formed. Meanwhile the other sample had remained unaltered. The same effect was shown quantitatively by diluting 4 Gm. of hydrocyanic acid to which 9 Gm. of ground glass had been added to 100 Cc., and keeping, the whole being well shaken occasionally. After three weeks 12.2 per cent. of the acid had decomposed.

It is stated that mineral acid is added to the commercial prussic acid (2 per cent. HCN) and to Scheele's acid as a preservative, and the reason for this is quite evident from the previous results. Samples of 2 per cent. and 4 per cent. acid were kept in 6 oz. bottles—the latter solution showed signs of decomposition after four months and the former after six months. Meanwhile, similar samples to which had been added 1 per cent. H_2SO_4 (calculated on the weight of HCN) remained unaltered. The time these acidified samples could be kept would, of course, depend on the quantity of mineral acid added, but from results obtained by the method next described it would appear that if as much as 10 per cent. H_2SO_4 (calculated on the weight of HCN) could be added such solutions would for practical purposes keep indefinitely. This method consisted in sealing up together the acid, a definite amount of powdered glass, and some third constituent added with a view to preserving the acid. The following results were thus obtained:

	(a) Amount of HCN used.	(b) Made up with 5 Cc. of	(c) Time before appearance of yellow color.
(1)	5 Cc. 8 per cent. acid.	Distilled water	2 days.
(2)	“ “ “	Absolute alcohol	2 days.
(3)	“ “ “	Dilute H_2SO_4 (1 per cent. on HCN)	23 days.
(4)	“ “ “	Tartaric acid solution (acid equivalent half that of the H_2SO_4 in Experiment 3)	12 days.
(5)	“ “ “	Water saturated with CO_2....	13 days.
(6)	“ “ “	Tartaric acid solution 0.04 Gm. in 5 Cc.	Unaffected after 4 months.
(7)	5 Cc. 4 per cent. acid.	50 per cent. glycerin	2 weeks.
(8)	“ “ “	Distilled water	2 weeks.
(9)	“ “ “	20 per cent. solution of mannitol	13 days.

In each case 0.5 Gm. of ground glass was added, and the sample shaken from day to day.

It appears from results (5) and (2) that carbon dioxide has considerable preservative influence on the acid, while absolute alcohol has none. It has been stated by Williamson that prussic acid containing 20 per cent. of glycerin keeps indefinitely; but no glycerin being available at the time, it was thought possible that such a compound as tartaric acid might prove useful, as it is both acidic and of similar structure to glycerin. It is evident, however, that the preservative influence of tartaric acid depends entirely on its acidity (3) and (4). Later, when some glycerin was obtained, it was possible to test the statement of Williamson, which, if true, would indicate the possible formation of a compound, just as boric acid forms compounds with glycerin and mannitol; but whereas the addition of glycerin increases the acidity of boric acid, such is not the case with hydrocyanic acid; and experiments (7), (8), (9) above show finally that neither glycerin nor mannitol has any influence in preserving the acid.

The only alternatives to the use of some such acid preservative as is suggested above would appear to be the use of some vessel from which water does not dissolve alkali, or the use of a glass vessel coated inside with some suitable neutral material.

TALC RESOURCES AND PRODUCTION OF SOUTH AFRICA.[1]

Talc has a wide distribution in the older rocks of the Union of South Africa, but has hitherto been worked only in the Barberton district of the Transvaal and in one or two other localities. In the Barberton district the talc occurs in the form of nearly vertical bands up to 15 feet in thickness, bounded by smooth joint planes, the "country" being a pale, dirty grayish or greenish massive ultrabasic rock, rich in magnesia, belonging to the Jamestown series. The purest form of reef matter constituting the first quality of "ore" is a delicate, pale greenish, subtranslucent rock possessing a well-developed fibrous structure, the slightly curved fibers being arranged more or less parallel with one another. Dark-colored varieties, often deep green and quite opaque, form the second quality of ore. Gold occurs in the talc as thin smears and films on joint planes, and the occurrence was originally worked as a gold mine. At present gold is a by-product of the talc-mining operations. The deposits have been opened up by means of shaft sand tunnels and the reserves of talc are said to be enormous.

Methods of Manufacturing First-Grade Talc Ore.—The talc mined goes to a dressing plant, in which the first and second grades of ore receive separate treatment. The better quality of talc is introduced in the form of small lumps into a distintegrator of the "cyclone" type, where it is ground to a fine powder, which is carried upward into a vertical elevator pipe by a strong current of air generated by a blower attached to the distintegrator. The most finely comminuted talc passes out of the top of the vertical pipe into a long, sausage-shaped vertical canvas balloon and drops into a receiver below as soon as the machinery stops. The material thus collected forms the best quality of ground talc. It is used principally for toilet and medicinal purposes. The coarser talc powder that does not reach the top of the vertical elevator pipe is carried off by means of a side piece to a very fine horizontal silk screen. The talc remaining on this screen is reground; that which falls through constitutes the second grade of ground talc. It is used for cleaning and drying corn and other cereals, for making soap and grease, for facing molds in brass foundries, and for treating the wounds and skin diseases of cattle.

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[1] *The South African Journal of Industries,* Pretoria, June. Reprinted from Commerce Reports.

MANUFACTURING LOWER GRADE TALC—TALC FOR PAPER AND RUBBER MAKING.—The lower grade of talc ore is sent through a five-stamp battery, in which any gold present is recovered, while the talc tailing, after being passed over a Wilfley table, is dried and screened. The talc thus obtained is used by boot manufacturers for leather dressing and finishing in the manufacture of paints and distempers, by garages and rubber manufacturers, in the preservation of eggs and fruits, and for making imitation stone and tiles. Part of the talc mined is cut into slabs for the manufacture of acetylene-gas burners, into square and round slate pencils, and into thicker engineer's pencils, which are used in large quantities by the South African railways.

The better grades of ground talc have been found well adapted to the manufacture of paper and rubber, and as the talc can be cheaply mined and railage from Noordkaap Siding to Delagon Bay is only 3s. 6d. per ton, it is confidently enticipated that a big export trade will be established in it when shipping space for this purpose is once more available.

PRODUCTION OUTSIDE OF BARBERTON DISTRICT—TOTAL PRODUCTION.—Ground talc is also being prepared in Johannesburg from a talcose schist, said to occur in the old granite to the north of Krugersdorp, Transvaal. No information regarding the deposit is available. Ground talc suitable for covering boilers and steam pipes is being obtained from a talc-tremolite rock near Pomeroy, on the Maceheko River, in Zululand. Massive talc or soapstone is a common mineral in southern Rhodesia, occurring in the Baesment Complex in large bodies in a more or less pure form. The fibrous variety used in paper making also occurs; the writer has seen some very fine specimens of foliated talc from this territory. A number of talc claims have been pegged in different localities, but as yet no attempt has been made to work any of the deposits.

The production of talc in the Union of South Africa has been as follows in the last three calendar years: 1915—44 short tons, valued at £218; 1916—132 tons, valued at £586; and 1917—785 tons, valued at £1,962.

CORRESPONDENCE.

DR. DOHME'S PLEA FOR THE RECOGNITION OF PHARMACY AS AN ESSENTIAL INDUSTRY AND PROFESSION.

Baltimore, Md., October 23, 1918.

American Journal of Pharmacy,
Philadelphia, Pa.

Dear Mr. Editor:

I am happy to be able to state that as the result of an effort on my part as per correspondence which I give below, I have secured a decision by the Surgeon-General and the Provost Marshal General Crowder, to the effect that drug clerks and registered pharmacists be not drafted into the army during the influenza epidemic, and that thereafter a deferred classification should be given them if they can show, as practically all of them can, that their position is "necessary to the enterprise in which they are engaged." This is the first successful effort made to have pharmacy recognized as an essential profession and industry and this should be promptly followed up and given all the publicity possible so as to get behind our movement for a pharmacy corps public sentiment through the press:

"Baltimore, October 10, 1918.

"To the Surgeon General's Office,
"Washington, D. C.

"*Gentlemen:* On behalf of the pharmacists and pharmaceutical colleges of this country I am again addressing you in this emergency brought to the attention of the people and the medical profession by the epidemic now raging all over the land. I appeared before your office with seventeen other representative gentlemen representing the National Drug Trade Conference in behalf of recognition of pharmacy as an essential industry and profession, on September 26, and were heard by General Richard and Colonel Darnall. You refused to recognize pharmacy as an essential industry and as a needed branch in the army establishment. Today the country is confronted by a demand for pharmacists' skill and services unprecedented in its history. Pharmacies by the hundred are being closed because their owners or their registered clerks are being drafted into the army. The result is pharmacies by the hundreds everywhere are overrun with prescriptions for the epidemic and they have to close their stores because they cannot handle the work, and many are working all night and day. Therefore the Provost Marshal, under the advice of the Surgeon General's office, should give registered pharmacists in the draft deferred classification to enable the civilian population to secure their medicines. Hundreds and thousands of patients are unable to procure medicines during the past few days and more and more pharmacists are lying down sick from overwork and worry which is fast bringing on a crisis all over the East. It would seem that pharmacy is today being shown to be one of the direst needs of the public and the medical profession to help quell the epidemic and save the lives of our people. Will the Surgeon General's office still refuse to recognize the need of the people today for pharmaceutical service? Please inquire of health boards in any of our cities and let them tell you of the deplorable conditions in the dispensing of medicines. Dr. John D. Blake, the health commissioner of Baltimore, told us today that he felt the Surgeon General's office had made a mistake in refusing to recognize pharmacy and should do so, and induce Provost Marshal Crowder to release many of the pharmacists in the draft for return to their stores to help out the fighting of this epidemic in this country by giving them deferred classification. I am enclosing a clipping from today's *Baltimore Sun* on the subject. The Educational Board also should recognize pharmacy students as worthy of forming if necessary in conjunction with other units military organizations, so that our colleges of pharmacy will not have to close and cut off the future supply of pharmacists so urgently needed at all times for the public health and especially so badly needed now.

"Respectfully submitted,
(Signed) "A. R. L. DOHME."

A copy of this same letter was simultaneously sent to Provost Marshal General Crowder, Surgeon General Rupert Blue of the Public Health Service, and Professor Charles E. Munroe, chairman of the Board of Educational Instruction.

The following reply was received under date of October 16 from the Provost Marshal General:

"Dr. A. R. L. Dohme,
"Member Executive Committee,
"American Drug Manufacturers' Ass'n,
"Care Sharp & Dohme, S. W. Cor. Pratt & Howard Sts.,
"Baltimore, Maryland.

"Dear Sir: I have read with interest copy of your letter of October 10, addressed to the Surgeon General's Office, in which the importance of pharmacy as a necessary industry is submitted. In order to overcome the situation brought about as a result of drug clerks being drafted into the Army and the heavy demands that are made upon pharmacists at the present time, it has been suggested that this office release many of the pharmacists who have been called to the colors and grant them a deferred classification so that they may resume their civilian employment, and assist in fighting the epidemic.

"Upon induction of a registrant into military service the jurisdiction of the Selective Service Law and of this office terminates, and all questions pertaining to the release of soldiers from the Army are consequently for the determination of the military authorities. Hence the suggestion advanced by the Health Commissioner of Baltimore could not be put into effect by this office.

"As far as the selection of men for military service is concerned, the matter lies entirely in the hands of district boards which are authorized, by the Selective Service Law, to consider claims for deferred classification based upon engagement in industries, occupations, or employments. The recognition of a particular trade or business as an 'essential' industry, occupation, or employment is not binding upon district boards which, in considering claims for deferment based on industrial or occupational grounds, must find, first: whether the industry, occupation or employment is 'necessary' to the maintenance of the military establishment, the effective operation of the military forces, or the maintenance of national interest during the emergency, and second, whether the individual himself is, within the meaning of the law, 'necessary' to the enterprise in which he is engaged.

"E. H. Crowder,
Provost Marshal General.
(Signed) "By Roscoe S. Conklin,
Lieut. Colonel, J.A.,
Chief, Classification Division.

And from the Surgeon General's office under date of October 18 has come as a response to my letter the statement that the Surgeon General's office has recommended to the Provost Marshal that drug clerks and pharmacists be not drafted into the Army during the influenza epidemic.

I feel that this information should go out at once through all pharmaceutical journals to the pharmacists of the country, so that they may be benefited promptly by the decision of the army chiefs. While I have had no reply yet from the educational committee, I have heard that colleges of pharmacy are being taken care of by permitting pharmacy students to join Army Reserve Units at educational institutions and I hope that every college of pharmacy will not fail to use this information to the utmost in helping itself maintain its position and courses and induce young men to continue to pursue its courses, for provision for future pharmacists must be made in the interest of the public health and welfare.

If we had adopted and put into effect federated pharmacy with a central office and an efficient well paid publicity department, we could have handled this epidemic and draft situation much more promptly and effectively.

Our hope now is that pharmacists will realize the value of co-operation and federation and not let the narrow views of a certain few men high in authority in certain associations, prevent the accomplishment of a much needed federated effort and organization in pharmacy.

I am also informed that many of the pharmacists in the army camps among the drafted men have been returned to their homes for service in this epidemic emergency; at least that is the case at Camp Meade here near Baltimore.

Very truly yours,

A. R. L. Dohme.

ON THE ADULTERATION OF SWEET MARJORAM WITH CORIARIA MYRTIFOLIA.

Glory, Honor and Gratitude to the Americans!

41 bis, Rue de Paris, Colombes (Seine), France,
October 4, 1918.

My dear Sir and very esteemed Colleague:

In the No. 8 issue (August, 1918), of the American Journal of Pharmacy I have read the interesting article you published on the adulteration of sweet marjoram by means of leaves of *Coriaria myrtifolia;* that's why I take pleasure in sending you a short article I published in March, 1911, on sweet marjoram and its adulterations.

Sweet marjoram, which is sold in large quantities in some regions of southern France, is very often adulterated there. Most of the samples submitted to me were presented in the form of a powder, more or less fine, a condition that very much favors the adulteration of vegetable products.

The sample to which my article refers contained but a very slight quantity of *Coriaria* and presented but inadequate characteristics from which to conclude as to the positive presence of this leaf; the arrangement of the stomata and the presence of ridges on the epidermis of the neighboring cells do not suffice to decide upon it; for I have come upon many such leaves which presented the very same characteristics: Though I have had occasion to study particularly the "Redoul" as a frequent agent of adulterating sumachs, which I have described under the characteristics in my memorandum on the adulteration of sumachs, I confess that I have been unable to guarantee the fact that my leaf found in the sweet marjoram was actually that of the *Coriaria myrtifolia.*

It is extremely frequent in appearance in sumach powders; it is also quite common in senna, and we are even surprised to find it there again frequently, since for over fifty years this fraud has been laid bare in all works on adulteration.

Now, to another subject! With what pleasure and enthusiasm we see arriving in France your magnificent and heroic soldiers, coming to bring help and relief to outworn France and at the same time to wrest the world from the Hun tyranny! Those who like myself have seen on two occasions the horrors of the German invasion and have for a period of fifty years been subjected to the humiliations and the consequences of defeat, will especially appreciate the grandeur of sacrifice that America has imposed upon herself, and we shall never forget it, nor will the younger generations, whose existence would have been made intolerable had there not been victory gained at last. The assassins of the "Lusitania" are not human beings—they are ferocious beasts enraged to the utmost degree, whom we ought to make disappear from the face of the earth.

Accept, very esteemed Colleague, the assurance of my high esteem.

(Signed) EUG. COLLIN.

THE PHILADELPHIA COLLEGE OF PHARMACY A TRAINING SCHOOL FOR U. S. NAVAL HOSPITAL CORPS.

American Journal of Pharmacy,
145 North Tenth Street,
Philadelphia, Pa.

Gentlemen: The United States Navy Department has selected the Philadelphia College of Pharmacy for government work. Through the Commandant of the Fourth Naval District of the United States, located at Philadelphia, the Department has directed that this well-known and justly esteemed school of pharmacy shall act as tutor to a selected class of one hundred and fifty naval hospital corps men for a period of at least three months intensive work in pharmacy and the collateral branches taught in this college.

The course will occupy five and one half days a week in attendance upon lecture and laboratory instruction in pharmacy and allied subjects at the college, and three evenings a week of instruction in typewriting; arrangements for this part of the work having been made with the Peirce School.

The Philadelphia College of Pharmacy is conducting this part of the work under the official designation—U. S. Naval Hospital Corps Training School of the Philadelphia College of Pharmacy.

These men will probably be placed later, not only in the U. S. Naval Service, but many of them will probably take charge of the dispensing and first aid work in the U. S. Merchant Marine, which will play such an important part after the war.

Very truly yours,
Charles H. LaWall,
Dean.

NEWS ITEMS AND PERSONAL NOTES.

Selling Plan of Colgate & Co. Sustained by Decision of United States Court.—In the United States District Court for the Eastern District of Virginia, the criminal prosecution instituted under the Sherman Act by the United States against Colgate & Company for its method of selling goods, has been decided, the court sustaining the demurrer of Colgate & Co. to the indictment.

Colgate & Co., manufacturers of toilet articles and soaps, for years had adopted a plan of marketing their goods only to such dealers as adhere to the re-sale prices fixed by the manufacturers. The Federal Trade Commission held that this method of selling is contrary to the law and claimed that it enhanced the price of these commodities to the consumer.

In an editorial commenting upon this suit (see AMERICAN JOURNAL OF PHARMACY, March, 1918, p. 157) we expressed an opinion that the method adopted by Colgate & Co. by which minimum prices were fixed for their products, which they ask their customers to observe in retailing such articles, did not appear to be an attempt to restrain trade.

The decision of the Court has sustained the contention of Colgate & Co. and upheld their method of selecting their customers and the Colgate plan of marketing products as being entirely within the right of the manufacturer. This decision must be viewed as an important one bearing upon the much discussed question of price maintenance.

ARMOUR & COMPANY'S PRODUCTION OF THE "IRON RATION."—What has been denominated as the "iron ration" of the American Army consists of a mixture of wheat and meat dried and ground to a powder and cakes of chocolate. Each ration weighs twelve ounces, and is put up in a small tin to fit the soldier's pocket, and contains the nutritive value equivalent to three meals. The ration can be eaten either dry, or mixed with cold or hot water, whichever is available.

To collect the machinery necessary to put up these rations would in ordinary times have taken months. On the spur of serving the army, the special machinery was installed by Armour & Co. in a little over a month, and in that time they were producing the rations at the rate of over 12,000 per day. During the last few months they have been supplying these at the rate of 60,000 tins per day.

THE GOLDWATER FORMULA DISCLOSURE ORDINANCE INVALID.—E. Fougera & Co., Inc., et al., contested this ordinance of the Health Department of the City of New York, and the Court of Appeals of New York State on October 15 decided the case in favor of E. Fougera & Co., Inc., declaring this ordinance invalid. The decision of the lower court in this case was that "It must appear first that the interest of the public generally as distinguished from those of a particular class require the interference by the board of health, and, second, that the means adopted for the purpose are not oppressive on individuals." The Court held that this ordinance in question met neither of these purposes. The appeal of the Department of Health from this decision of the trial court has not been sustained, and the Court of Appeals unanimously upheld the Appellate Court's decision and expressed the opinion that the ordinance and regulations have too remote a relation to the public health and are therefore invalid.

THE ALIEN PROPERTY CUSTODIAN TO SELL CHEMICAL PROPERTIES.—A. Mitchell Palmer, Alien Property Custodian, announces that certain chemical manufacturing plants, taken over under the Alien Property Law, will be sold at public auction. The Bayer Company sale will take place on December 3 to American citizens only, while on December 4th the Heyden Chemical Works of Garfield, N. J., will likewise be sold at public auction.

SERVICE FLAG OF THE JACOBS PHARMACY.—Mr. Joseph Jacobs, of Atlanta, Ga., advertises in the local newspapers his service flag showing that forty-six of the employees of the Jacobs Pharmacy are in the military service of the United States.

JAMES E. BARTLETT ELECTED A DIRECTOR OF PARKE, DAVIS & CO.—Succeeding the late Charles Stinchfield, a Detroit business man whose death occurred in the latter part of September, James E Bartlett has been elected to the board of directors of Parke, Davis & Co. Mr. Bartlett is assistant secretary and sales manager of the corporation, a post to which he was called in July of 1913. He entered the service of the house in 1889 as a traveling salesman. Later he was transferred to the Detroit laboratory, eventually becoming its general superintendent. For seventeen years (1896 to 1913) he was manager of the company's Chicago branch.

MEMBERS OF THE P. C. P. FACULTY IN THE ARMY SERVICE.—Four members of the faculty of the Philadelphia College of Pharmacy are now engaged in the military service of the government. Professor Roddy is now a major in the Medical Corps; Professor Fitzkee a lieutenant in the aviation service, and Drs. Fischelis and Foran are in the Chemical Service Section.

THE AMERICAN
JOURNAL OF PHARMACY

DECEMBER, 1918

EDITORIAL.

PROFESSIONALISM AND PHARISAISM.

In the light of recent events, the query is propounded what is professional pharmacy? Accepting the meaning as laid down in the accepted dictionaries:—Pharmacy "is the art or practice of preparing, preserving and compounding medicines, and of dispensing them according to the formulæ or prescriptions of medical practitioners." These authorities commonly elucidate further by stating "the occupation of a druggist" or "the occupation of an apothecary or pharmaceutical chemist." Thus the lexicographers support the synonymous use of the words pharmacist, apothecary and druggist.

Profession is defined in the Century Dictionary as "The calling or occupation which one professes to understand and to follow: vocation, specifically a vocation in which a professed knowledge of some department of science or learning is used by its *practical application* to the affairs of others, either in advising, guiding or teaching them, or in serving their interests or welfare in the practice of the art founded upon it." This standard work further explains: "The word implies professed attainments in special knowledge as distinguished from mere skill, a practical dealing with affairs, as distinguished from mere study or investigation, and an application of such knowledge to uses for others *as a vocation*, as distinguished from its pursuit for one's own purposes."

The acceptance of these definitions would justify the opinion that the practical application, *as a vocation*, of the special knowledge of the art of preparing, preserving, compounding and dispensing, constitutes professional pharmacy. A contingent of extremists, however, would set aside the authority of the lexicographers and adopt a definition for professional pharmacy that would eliminate many of those who have devotedly served as pharmacists in their respective communities and would restrict pharmaceutical professionalism to those "professional pharmacists who are with our colleges of pharmacy and our pharmaceutical manufacturing houses." By arrogant assumption these would apply the term pharmacist to many who have never devoted either time or study to pharmacy as a vocation and who are actually outside of the etymology of the term professional pharmacy. A supercilious air of superiority has been assumed by some whose limited field of specialized study and lack of experience would not justify placing them in charge of a pharmacy with any expectation that they could successfully discharge the numerous commercial and professional services demanded of the practical pharmacist.

Throughout the entire world's history, society has demanded of the apothecary many services not strictly pharmaceutic and the supplying of many articles besides medicine. This is readily accounted for by the wide range of substances that have been more or less associated wtih the healing art and the store of general knowledge required of the druggist. In the Mosaic records we find the art of the apothecary applied not only in the preparation of the ointments of that day but likewise to the manufacture of confections, incenses and perfumes.

It is admitted that the unethical practice of medicine in this country and the business spirit of the age has led many of our druggists to give more attention to side lines and commercial matters than to the professional duties of their vocation and that some of their stores bear but little resemblance to pharmacies. This is an evil which in time will be corrected by education, well-defined rules for the ethical practice of medicine and pharmacy supported by legislation. This calls for a propaganda of education and rectification but it is not a proper ground for the basing of a wholesale denunciation and condemnation of the pharmacists of the United States and a discrediting of the work of the pharmaceutical schools and journals upon whose conscientious efforts with the coming generations of pharmacists will depend very largely the elimination of such errors of practice. Do any of the other professions indulge in such wholesale denunciation of their members because some engage in unethical and demoralizing practices?

Proper education is a fundamental to the professional status of any vocation and before American pharmacy can be considered as established upon a scientifically sound professional basis, we must have a law in every state, territory and insular possession that will fix as a prerequisite to the license to practice pharmacy a proper preliminary scholastic attainment followed by a pharmaceutical education in an approved school of pharmacy. Our pharmaceutical associations, both state and national, have been very lax in their duty in not securing this primary essential for the recognition of pharmacy as a profession. As we study the statistics available on this subject, we are confronted by an anomaly, namely, that some of the states that are supporting universities and whose teachers in the department of pharmacy are energetically declaiming professional pharmacy, have no such prerequisite laws. Under these conditions, it is evident that pharmaceutical reform should be initiated at home.

Much has been said of the need for original research and investigation in pharmacy and the writer is heartily in accord with the idea that research is a proper corner stone for our structure of professional pharmacy. However, as we review the situation, we recognize that this limitless field of investigation has not been neglected by American pharmacists; that they have made many valuable contributions and doubtless in the future many more studies worthy of the name of research will demonstrate American ingenuity and ability in this line of work. A review of the literature covering pharmaceutical research, exhibits another anomaly, namely, that many of those who have been so pronouncedly professional in thought and so generous in the advocacy have not been constructive contributors to pharmaceutical research and some of their names do not appear connected with any work worthy of the name of research. There can be no comparison between lip service and scientific accomplishment and the untilled fields awaiting their energies is an undeniable appeal.

The advancement of pharmacy will be by the processes of evolution and not by revolution. The leaven is at work, the internal work is progressing and the education of the public as to the value of pharmacy is proceeding, perhaps too slowly, and requiring further speeding assistance. Let us build the structure, in which we are so vitally interested, on the solid foundation of genuine professional pharmaceutical service and devoid of pharisaism.

G. M. B.

AN EDITORIAL CAMOUFLAGE.

In the current issue, our esteemed cotemporary the *Northwestern Druggist* publishes an editorial under the caption "Camouflage in Pharmacy." In this the learned editor has painted a disparaging word picture of the practice of pharmacy in the United States. If his portrayal be true, then to say the least, it cannot be considered as at all creditable to the pharmaceutical educators of the country, among whom we include the editor, who have devoted so many years to the teaching of "technical and scientific pharmacy."

That pharmacy as practiced in many drug stores, does not measure up to proper ideals is granted; but is not a similar statement equally true regarding the practice of every profession? In his attempt to discredit commercialism in pharmacy, our editorial friend has permitted his earnestness to lead him into vehement statements and wholesale denunciation which will not withstand deliberate analysis and a comparison with the established facts.

The following extracts are examples of the specious arguments presented:

"In the construction of the U. S. P. IX, the peer of all national pharmacopœias, he has been conspicuous by his absence. Scientific prescription dispensing of a very high order is well known but rarely practiced.

"Our present pharmacopœia has been held up as a criterion of the professional standing and scientific qualifications of the retail druggists of America. This is pure camouflage. On the entire revision committee, which committee is responsible for the U. S. P. IX there are only two retail pharmacists and one is a professor in a college of pharmacy.

"The U. S. P. IX reflects the progress which scientific and professional pharmacy has made during the past fifteen years in this country. It is the work of professional pharmacists who are with our colleges of pharmacy and our pharmaceutical manufacturing houses. It is an indication of the required professional qualifications which the public has a right to expect of those who compound and dispense medicines."

By no means are we willing to admit that "scientific prescription dispensing is rarely practiced." Neither are we as American pharmacists willing to admit that the dispensing in the United States is not as scientific and as exact as in any other country. In an experience of more than forty years, it has been my good fortune to become acquainted with many practical pharmacists as well as with very many estimable teachers in the schools of pharmacy and these alike have upheld the ethics of the profession and, possessing the requisite knowledge, have taken pride in their ability to compound and dispense medicines in the most skillful and scientific manner. The impression that remains is that there is no town of any size in the United States where scientific prescription dispensing of a very high order is not practiced. Our friend possibly has failed to attend the meetings of the Section on Practical Pharmacy and Dispensing of the American Pharmaceutical Association.

The Pharmacopœia of the United States is admittedly the peer of any national pharmacopœia, but who has made it so? The U. S. P. IX is the product of the improvements and advances incorporated in each of the previous revisions and since the revision of 1840, practical pharmacists have contributed very largely to the revisions. Can our friend be so unacquainted with the history of the various revisions of the pharmacopœia that he fails to give due credit to the work of the practical pharmacists thereon? Many of the formulas, admitted by foreign authorities as being superior to their own, have been originated or improved by practical pharmacists and these have added greatly to the reputation and admitted high standing of our national pharmacopœia.

The statement that there are only two retail pharmacists on the present committee of revision is not correct and further it is very misleading. A reference to the list of the members selected by the Pharmacopœial Convention as the Committee of Revision as published in the preface of the U. S. P. IX,—pages xlii–xliii, will prove this statement to be erroneous. Further, it can be shown that a very large percentage of the committee had a pharmaceutical education and that, at some period, many had been engaged as practical retail pharmacists and no doubt their work in the revision amply reflected the knowledge and experience gained in such professional service. Moreover, in the recent filling of vacancies on this committee, at least three more retail pharmacists were elected.

The pharmacists have certainly no reason to offer apologies for the quantity or the quality of the services they rendered in the revisions of the Pharmacopœia of the United States.

G. M. B.

BOLSHEVISM IN PHARMACY.[1]

By Charles H. LaWall, Ph.M.

Words and phrases have associated concepts which may differ so greatly in different individuals that when these individuals enter into a discussion they are often talking about things which are diametrically opposed. "Pharmaceutical education," "pharmaceutical practice" and "pharmaceutical progress" are examples of phrases, often the subject of controversy, in which there is no common ground of understanding. Indeed it is often true that these concepts are changed in the individual under the influence of time and environment. No definition of a liberal education has ever been given which surpasses the following, by Huxley, which is quoted to show how comprehensive and detailed a definition sometimes becomes.

"That man, I think, has had a liberal education who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that, as a mechanism, it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength, and in smooth working order; ready like a steam engine to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of nature and of the laws of her operations; one, who, no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of nature or of art, to hate all vileness, and to respect others as himself."

When we come to the question of pharmaceutical education or any other kind of scientific or professional education, however, we are dealing with a more restricted and specialized field. Without attempting to inflict upon you an arbitrary definition of this kind of education, I will state that I believe *that man is best educated who is most useful to his community and to his profession or trade,* whatever it may be. For further explanation of my personal views on some of these questions, I will take the unusual liberty of referring you to two previous articles in which I have expressed them. One is the address of the chairman of the Section on Education and Legislation of the American Pharmaceutical Association, published in the Proceedings for 1910, page 605. The other is an article entitled "When is an Education not an Education?" *Journ. A. Ph. A.*, 1915, p. 176. The views expressed on fundamentals in these two articles have not materially changed during the passage of time, but conditions have recently arisen which seem to call for further expression of opinion on certain phases of the situation.

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[1] Read at the November meeting of the Philadelphia Branch of the American Pharmaceutical Association.

There seems to be at present, a peculiar tendency to throw discredit on commercialism of any kind in connection with pharmacy. The reason for this is seen every time one looks into the windows or sees the advertisements of a certain type of drug store, but why the large number of high minded, ethical pharmacists, who are practicing their profession with the respect and support of leading members of the medical profession in their communities, should on that account be held up to scorn, is hard to understand.

We are led to believe that because Mr. X. or Mr. Y. makes a larger proportion of his gross profits from the sale of merchandise other than drugs, that pharmacy is going to the dogs. Why should any stigma attach to a man because he is a good merchandiser? This double responsibility of such an individual to the community has been well expressed by Dr. Jacob Diner as follows:

"On one side we must have the professionally trained man; on the other we must prepare the same man to be commercially able to avail himself of every honest, legitimate means for the financial advancement of his business."

The attempt to classify pharmacists according to professional attainments has been recurrent for centuries past. One of the first recorded legal enactments affecting pharmacy was that of Frederic II of Sicily in 1233 A.D. This law mentions "apotheca" in the sense of warehouses where drugs were stored; compounders of medicines were called "confectionarii," and sellers of simple medicines were called "stationarii." As throwing light on the subject of "side lines," the following will be found of interest:

In the sixteenth century the Guild of Nuremburg druggists presented a memorial of grievances in which, among others, are the following complaints:

1. The sale of all confections has now fallen into the hands of the sugar dealer.

2. Counter sales (of spices) are now made by all of the large

spice and cheap corner grocery shops, thus robbing the druggist of a source of profit that he is justly entitled to.

3. The sale of sundries, such as sealing wax, fumigating pastilles, paper, ink and pens, is now taking place in common huckster shops.

4. The sugar dealers are not only selling confections but also all kinds of fruit juices and all such preserves as do not deterioriate in the course of a year.

These same Nuremburg pharmacists stated that "many of our brethren have matriculated at universities, some have attended academies and others have even graduated as doctors. We consider that our profession is not a trade but is in reality a free art."

In the eighteenth century the pharmacists were held in derision for their claim to professional recognition, by Professor Hoffmann, one of the early professors of the University of Halle, who stated their scope of knowledge in the following way:

"The apothecary should know that an acid and an alkali, when brought into contact, will effervesce. It will suffice if he but know the effect although he may be ignorant of the cause."

Business or commercial ability is fundamentally responsible for success in any profession or for the continued existence of educational institutions, even those engaged in the most academic and intellectual lines of work. All rivalry or competition is in reality commercial rivalry or competition, and whether this is carried on fairly or unfairly depends upon the underlying principles of honesty, fair dealing and ethics possessed by the participants.

What are the primary objects of a college education in pharmacy? Is it to produce mental contortionists and star performers who can assimilate syllabi and transform the pabulum into passing marks for registration examinations, or is it to produce worthy, helpful members of the community? If we decide that the latter is preferable, the means must be studied and methods applied which will tend to produce the desired results. I say "tend to," for no idealistic attainment of results will ever be possible. We must work toward a desired end, whether we at first reach it or not.

We must discourage empiricism in scientific work and encourage an interest in and thoroughness of training in principles. Efficiency, success, service, are all factors of value and importance. We must encourage and teach the student to become accurate in his work and in his habits of thought, and if our work is conscientious and thorough, and the student is receptive and interested, we shall have contributed to the community an individual who will be a credit to his work and to his college and who will be a safe and ethical dispenser of extemporaneous medicines, whether they constitute five or fifty per cent. of his gross sales.

A certain number of the members of any group of young men and women have a natural aptitude and a greater liking for scientific work than for general drug store work. These should be given the necessary post graduate instruction to enable them to become the neighborhood analysts and bacteriologists, to act as clinical advisers to the physicians of their communities, and should be trained to be helpful even along the broader lines of sanitation and hygiene, so as to give aid to local health officers when needed. The preliminary education required for the best results should be a minimum of four years of high school work. This requirement should be enacted into the State laws, as has recently been done in the State of Illinois.

Any college of pharmacy with the proper equipment and instructional staff should be able to, and should have the right to teach both of such classes of pharmacists in such numbers as present themselves with properly accredited entrance credentials. That pharmacy is gradually separating into two distinct classes no one will deny. That it has been predicted for years, everybody knows. That it can be brought about over night by resolution, agreement or law, is impossible. Such views savor of Bolshevism, a specious, plausible, irresponsible type of propaganda which has been worrying statesmen for several years, but has not previously appeared in educational discussions.

To accomplish these changes needs more than the fiat of any individual or group of individuals. We cannot effect reform by resolution any more than we can decide scientific questions by a majority vote. Diplomas, degrees and certificates are but "scraps of paper" unless upheld by legislative enactment. Reformers frequently forget that laws are primarily for the protection of the public and not for the development of theories which are impossible to put into practice.

It is in the matter of legislation that we find our greatest stumbling block to rapid progress. Our prerequisite legislation is too recent and not widespread enough as yet, to make such radical changes as would be necessary to effect an immediate sharp separation between drug merchandisers and professional pharmacists, desirable as it may seem in some extreme instances. Economic factors would be ignored, State laws would need to be changed, boards of pharmacy would have to cast aside the traditions and practices of a generation. Dr. Beal has truly said "Compromise is the price of progress," and with this thought in mind, we should take pains to see that legal restrictions and educational qualifications should be coordinated and drawn closer together, not forced apart.

Looking back, therefore, at the whole subject, it is clear to my mind that any educational institution should be proud of the opportunity of training both pharmacists and druggists, if by druggists is meant the large number of self-sacrificing individuals who, during the recent influenza epidemic, closed everything but their prescription departments so as to devote their entire attention to the pharmaceutical needs of the communities in which they practiced.

The object of an education is that a man may learn to benefit himself by serving others, one who exemplifies the words applied by our own Dean Remington to a noble deceased pharmacist:

"A man whose soul is pure and strong,
Whose sword is bright and keen;
Who knows the splendor of the fight
And what its issues mean."

THE PERCENTAGE OF STEMS IN BELLADONNA HERB AND ITS EFFECT ON THE QUALITY OF THE HERB.

By Arthur F. Sievers.

The Ninth Decennial Revision of the United States Pharmacopœia describes Belladonna Folia as follows: "The dried leaves and tops of *Atropa Belladonna* Linné (Fam. Solanaceæ), without the presence or admixture of more than 10 per cent. of its stems or other foreign matter, and yielding not less than 0.3 per cent. of the total alkaloids of Belladonna Leaves."

Previous to the ninth revision the stems were not allowed to be present. The change was brought about for two reasons. First, investigations had shown that belladonna stems not exceeding a reasonable size contain a considerable percentage of alkaloids; and second, the expense of harvesting the crop in this country is greatly reduced by eliminating the expensive hand labor involved in picking the individual leaves. The change has aided greatly in stimulating the production of belladonna in the United States.

In connection with this change the question naturally arises as to what sized stems may be included when the herb is cut in order to limit the stems to 10 per cent. of the total herb. The inclusion of the stems makes harvesting by means of a sickle or large machinery possible, but by allowing only 10 per cent. of stems it becomes necessary in most cases to strip the material by hand in order to eliminate the larger stems. If it should be found that the inclusion of a greater percentage of stems does not greatly lower the therapeutic quality of the herb it would seem to be greatly to the interest of the grower to modify the official designation of the herb to that extent. It was for the purpose of securing some data on these questions that the following experiments were undertaken.

Belladonna Herb at Various Stages of Growth.—Sprouts of belladonna were cut at eight different stages of growth. The sprouts were cut at the ground and selected from different parts of the field to eliminate as far as possible the factor of individual variation. The sprouts were immediately weighed, a number of them were reserved to be studied as whole herb and the remainder were separated into leaves and stems both of which were weighed at once. All the parts were then allowed to dry in a well-ventilated room and finally in a hot air oven at 50° C. They were then weighed and ground to a no. 40 powder. A small quantity of the powder was dried over sulphuric acid to constant weight and the amount of residual moisture determined. All the results in the tables are calculated on the water free basis. In Table I are given the data relating to the proportion of stems in the herb.

It will be seen from the table that the eight stages represent a wide range of growth. At the first stage the sprouts were very small and the stems, while relatively large in diameter, were very short. On the other hand, at the last stage the stems were woody and the leaves were fewer in proportion. The moisture content of the stems does not appear to differ greatly in the first seven stages but in the last stage the pith was considerably less succulent which fact is indicated in the reduced moisture content. In the leaves, too, the moisture content is considerably lower in the last stage when the larger leaves are beginning to dry up somewhat. Likewise in the whole herb the percentage of moisture is considerably reduced in the last stage.

TABLE I.

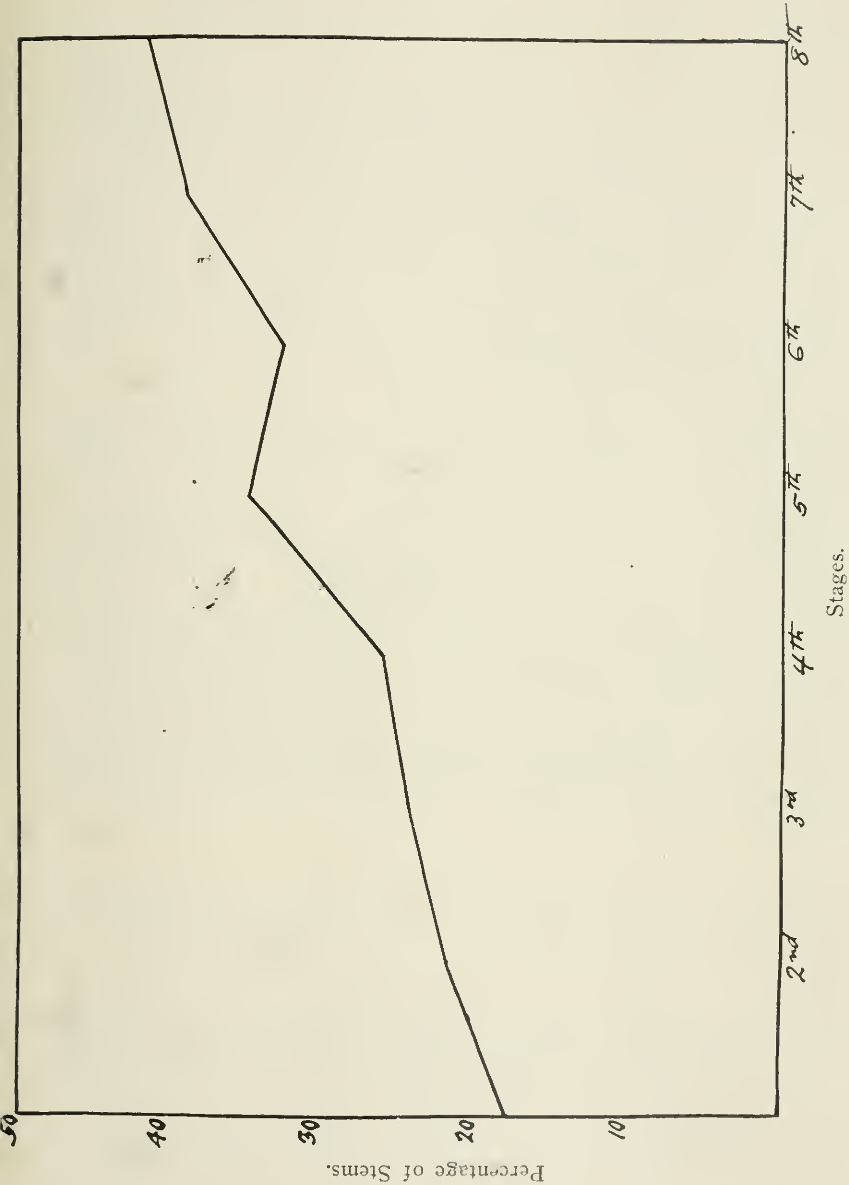
Size and Proportion of Stems and Leaves in Sprouts Cut at Various Stages.

Stage.	Sprouts.		Stem.					Leaves.			Ratio of Dry Stems and Leaves in Sprouts.		Whole Herb.		
					Weight.			Weight.					Weight.		
	No. Picked.	Length (Cm.).	Length (Cm.).	Diameter at Large End (Mm.).	Green (Gm.).	Dry (Gm.).	Moisture, Per Cent.	Green (Gm.).	Dry (Gm.).	Moisture, Per Cent.	Leaves, Per Cent.	Stems, Per Cent.	Green (Gm.).	Dry (Gm.).	Moisture, Per Cent.
1	52	16.5–20	9–14	6–9.5	201.5	14.36	92.9	509.4	65.3	87.2	81.97	13.03	107.3	12.43	88.37
2	32	25 –29	15–20	8–10	253.5	16.58	93.46	449.8	59.72	86.72	78.27	21.73	154.3	15.38	90.03
3	28	29 –34	21–26	10–14	462.0	29.54	93.60	686.3	92.2	86.57	75.72	24.28	269.25	25.63	90.89
4	15	38 –43	31–34	14–16	503.3	28.06	94.43	660.5	80.54	87.81	74.16	25.84	310.55	30.34	90.23
5	10	55 –60	38–45	14–17	498.5	36.54	92.67	512.0	68.2	86.68	65.12	34.89	233.0	24.88	89.32
6[1]	5	65 –70	50–55	16–18	450.9	29.69	94.07	372.5	60.94	83.64	67.24	32.76	413.0	38.03	91.79
7[2]	6	80 –85	55–58	18–19	664.0	57.66	91.32	638.0	90.79	85.77	61.16	38.84	203.0	20.75	89.78
8[3]	2	88 –100	50–58	18–19	334.0	56.49	83.09	435.0	79.37	81.75	58.42	41.58	534.0	86.6	83.78

[1] Fork with 3 sprouts 2 inches long at end of main stem.

[2] Fork with 3 sprouts about 3 to 6 inches long at end of main stem and at end of each of these a secondary fork with 2 or 3 sprouts 1 to 2 inches in length. A few flowers and many small buds present.

[3] Main fork of 3 or 4 sprouts about 6 inches long at end of main stem and a secondary fork at end of each of these with several sprouts 10 to 12 inches long. Flowers and green fruit and unopened inflorescence included in "leaves." Secondary sprouts were present at the axles of the large leaves. These had stems up to 10 inches in length and were separated into stems and leaves and mixed respectively with these parts from the main sprouts.



GRAPH I.—Percentage of Stems present in the herb at various stages.

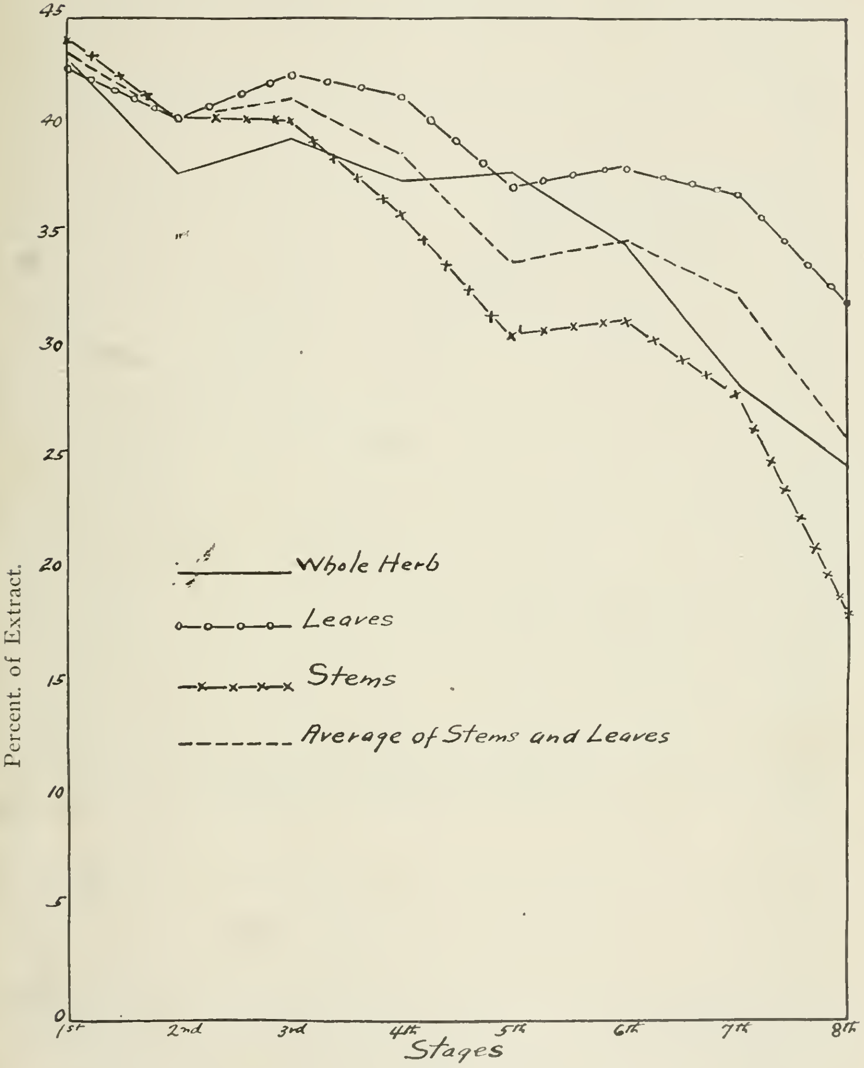
"A study of the table or of Graph I will show that in the smallest sprouts cut, the 1st stage, the stems represented 18 per cent. of the total dry weight. As growth continued this percentage gradually increased until it reached 41.58 per cent. at the eighth stage. Thus it will be seen that although the first material was picked when the stems were only 9 to 14 cm. long the percentage which these represent of the total dry weight is 8 per cent. more than allowed by the Pharmacopœia. It is evident, therefore, that in order to comply with the official description of belladonna herb machine harvested material cannot be used as such and must be resorted or stripped. It would seem therefore that the change made in the last revision of the Pharmacopœia has not been as great an aid in the matter of harvesting belladonna as might be desired.

The question naturally arises whether it would be possible to increase the permissible percentage of stems in the herb without greatly decreasing the therapeutic value of the herb. In order to determine this point the above samples of leaves and stems and whole herb were in each case assayed for total alkaloids and the percentage of alcoholic extract was determined. Ash determinations were also made to determine whether the ash content of the herb could be used as a basis for judging the percentage of stems present. The percentage of alcoholic extract was determined by means of the process described under "Extractum Belladonnæ Foliorum" of the Pharmacopœia. The extract was heated on a water-bath until of constant weight and the percentage thus determined. No assay of these extracts were made. The results are given in Table II and Graphs II and III.

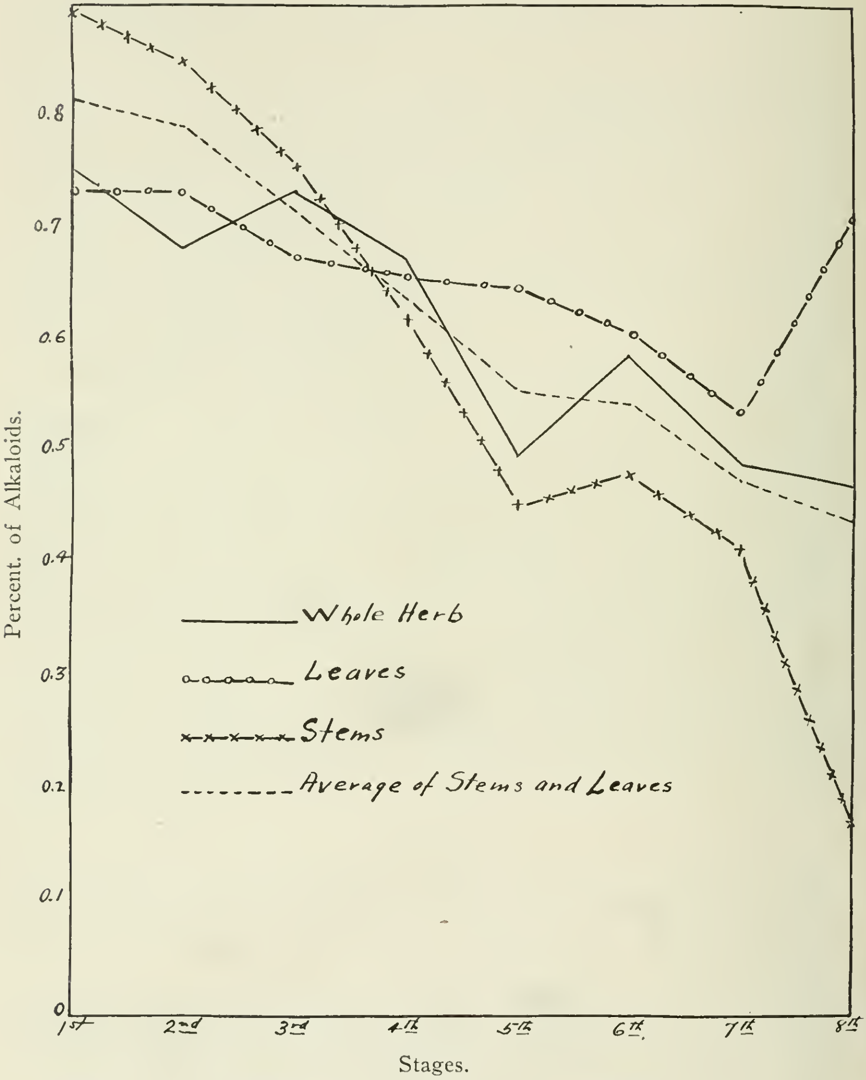
TABLE II.

Percentage of Ash, Alcoholic Extracts, and Total Alkaloids in the Stems, Leaves, and Whole Herb at the Different Stages.

Stage.	Ash.			Alcoholic Extract.			Total Alkaloids.		
	Leaves, Per Cent.	Stem, Per Cent	Whole Herb, Per Cent.	Leaves, Per Cent.	Stem, Per Cent.	Whole Herb, Per Cent.	Leaves, Per Cent.	Stem, Per Cent.	Whole Herb, Per Cent.
1	12.36	16.68	12.17	42.7	44.0	43.0	0.737	0.898	0.756
2	11.74	18.11	14.24	40.4	40.3	38.1	.733	.851	.759
3	12.16	17.52	14.29	42.4	40.4	39.5	.677	.759	.733
4	12.77	18.79	14.63	41.4	36.1	37.7	.658	.620	.673
5	11.59	13.88	12.82	37.3	30.6	38.1	.650	.455	.498
6	13.79	18.10	14.61	38.1	31.4	34.9	.610	.481	.589
7	12.61	13.63	13.11	37.1	28.0	28.6	.537	.417	.494
8	12.02	9.78	8.32	32.1	18.1	24.9	.712	.170	.471



Graph II.—Percentages of Alcoholic Extract in the whole herb leaves and stems.



Graph. III.—Percentages of total Alkaloids in the whole herb, leaves and stems.

Regarding the ash content, there appear to be a number of inconsistencies in the results. The leaves show approximately the same ash content at all the stages but the stems seem to decrease in ash as they get larger. This is also true of the whole herb. It would seem doubtful from these results whether the ash content alone is a reliable criterion of the percentage of stems in the herb.

The percentage of alcoholic extract which can be obtained from the material decreases steadily from the first to the eigth stage. The stems show the greatest range in the amount of extract yielded, the highest being 44 per cent. at the first stage and the lowest 18.1 per cent. at the eighth stage. The leaves show a decrease of only about 10 per cent. from the first to the eighth stage. While the decrease in percentage of alcoholic extract is general it is evident from the tables and graphs that 25 per cent. of stems may be included in the herb without reducing the percentage of extract more than 6 per cent.

The percentage of total alkaloids also decrease through the different stages. This is decidedly marked in the stems, 0.898 per cent. being present at the first stage and 0.170 per cent. at the last stage. In the leaves the percentage decreases gradually and reaches the minimum of 0.537 per cent. at the seventh stage. At the eighth or last stage the percentage had increased again to 0.712 due, no doubt, to the presence of a considerable number of young leaves and shoots at this stage. The whole herb decreased in total alkaloids from 0.756 to 0.471 per cent., and at no stage was the percentage as low as the minimum set by the Pharmacopœia. The results plainly show that all the stems in the herb could be included in the sample without reducing the alkaloidal content below the pharmacopœial standard.

EFFECT OF THE PRESENCE OF VARIOUS PERCENTAGES OF STEMS ON THE QUALITY OF THE HERB.

In the second part of this investigation an attempt was made to determine how the quality of the leaf is affected by the successive admixture of stems of certain diameter. A quantity of herb was cut at a stage corresponding to the eighth stage in the experiment previously described. The leaves, including all buds, flowers, and fruit, were immediately separated and weighed and designated as mixture A. The stems were then cut up into portions according to diameter and weighed and labeled successively from 1 to 8. Portion 1 consisted of stems from 2 to 3 Mm. in diameter while portion 8 consisted of the parts of the large stems from 17 to 20 Mm. in diameter. All portions were dried in a well ventilated room and finally in a hot-water oven. The last traces of moisture were determined by drying the powdered material over sulphuric acid to constant weight. Table III gives a summary of the various portions of stems.

TABLE III.

Moisture Content and Diameter of the Stems in the Eight Successive Portions.

Portion.	Diameter (Mm.).	Weight.		Moisture, Per Cent.
		Green (Gm.).	Dry (Gm.).	
1	2–3	96.7	17.56	82.25
2	3–5	100.0	18.53	81.47
3	5–6	91.0	17.00	81.32
4	6–9	142.0	25.38	82.13
5	9–12	119.0	20.61	82.77
6	12–14	136.0	28.30	79.19
7	14–17	151.0	21.80	85.57
8	17–20	186.0	31.94	82.83

After the portions were all thoroughly dry they were ground as finely as possible and then added successively to mixture A. After the addition of each portion the percentage of ash, alcoholic extract, and alkaloids were determined. In Table IV the results are summarized.

It is obvious from Table III that the stems in portion 8 weigh almost twice as much as those from portion 1. In a general way there is a gradual increase in the weight of the dry stems in the successive portions. The percentage of moisture is approximately the same in all the portions.

As indicated in Table IV the percentage of ash, alcoholic extract and total alkaloids of mixture A were first determined. This mixture included only the very small stems up to 2 Mm. in diameter which forms a part of the flowering top. To A was then added portion 1 which consisted of stems from 2 to 3 Mm. in diameter. After thorough mixing the percentage of ash, alcoholic extract and total alkaloids were again determined. To this mixture portion 2 was then added and so on until all the portions had been successively added. The final mixture then approximately represented the whole herb. Graph IV shows the percentage of stems present in the mixture after the addition of each successive portion.

It will be noted that if a maximum of 10 per cent. of stems is

TABLE IV.

PERCENTAGE OF ASH, ALCOHOLIC EXTRACT AND TOTAL ALKALOIDS IN SUCCESSIVE MIXTURES OF MIXTURE A WITH PORTIONS 1 TO 8 OF THE STEMS.

Mixture.		Per Cent. of Total Stems Present.	Ash, Per Cent.	Alcoholic Extract, Per Cent.	Alkaloids, Per Cent.
No.	Nature.				
A	Leaves[1]	—	13.84	26	0.580
B	A + portion 1[2]	6.51	10.2	26	.586[3]
C	B + portion 2	12.53	10.11	27.6	.572
D	C + portion 3	17.07	10.05	25.8	.519
E	D + portion 4	23.74	9.46	22	.510
F	E + portion 5	28.22	9.28	21.4	.478
G	F + portion 6	33.57	9.09	21.8	.456
H	G + portion 7	37.01	8.83	20.00	.345
I	H + portion 8	41.82	8.71	21.2	.336

allowed in the herb all stems above 5 Mm. in diameter will have to be excluded. The percentage of ash decreases with the admixture of more stems from 13.84 to 8.71 per cent. The percentage of alcoholic extract also decreases slowly from 26 to 21.2 per cent. while the percentage of total alkaloids decreases from 0.58 to 0.336 per cent. Graphs V and VI serve to illustrate these points. Here again it is shown, as in the first part of the paper, that all the stems could be included in the herb and the percentage of alkaloids would still be higher than the minimum allowed in the Pharmacopœia. However, where a poor quality of herb is involved in which the percentage of total alkaloids is low the addition of all the stems would very likely reduce the percentage too far.

Taking a fair quality of herb such as is readily produced in this country, as an example, a mixture of approximately the composition of D or E should be a very marketable product. Such an herb would contain about 20 per cent. of stems up to 7 or 8 Mm. in diameter when green. It would contain about 10 per cent. of ash,

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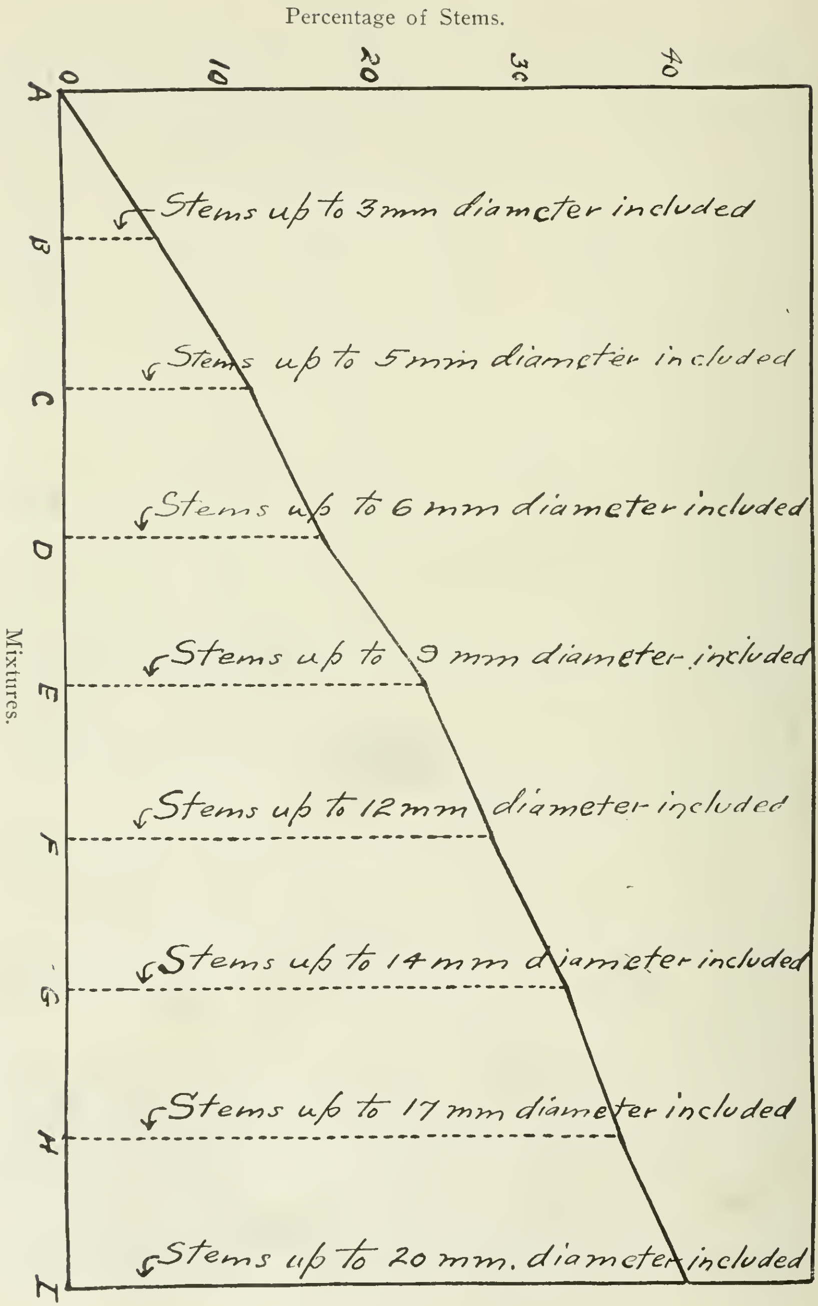
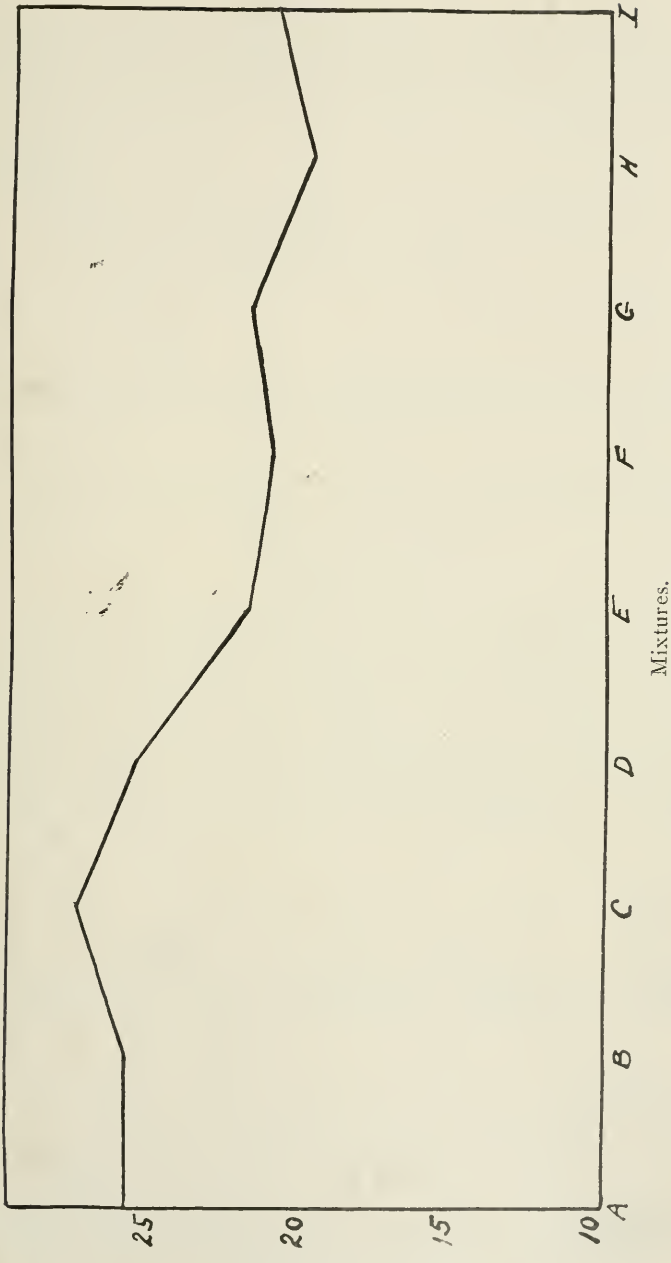
[1] Consists of all leaves and buds, flowers, and berries but contains no stems more than 2 mm. in diameter.

[2] See Table III.

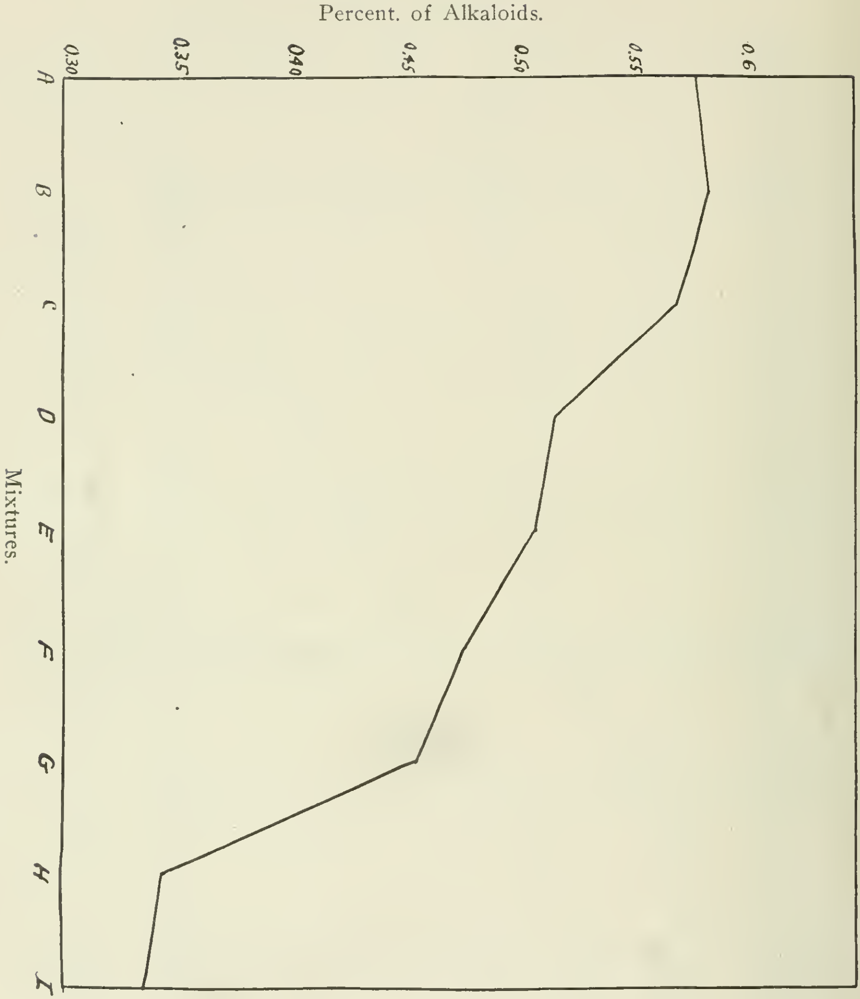
[3] Since approximately 10 to 12 Gm. of material had to be removed after the addition of each portion to make the several determinations, the influence of the addition of the succeeding portion of stems is slightly intensified, and consequently, since the effect of adding the stems is to reduce the percentage of alkaloids, the percentage as found is slightly lower than it would have been if no small fraction of the previous mixture has been removed. However, inasmuch as the percentages actually obtained are thereby reduced the conclusions based on these results are in no wise affected. This is equally true in the case of the alcoholic extract and the ash.



GRAPH IV.—Percentage of Stems in successive mixtures and the maximum diameter of the stems included in each.



Graph V.—Percentages of Alcoholic Extract in the successive mixtures.



Graph VI.—Percentages of total Alkaloids in the successive mixtures.

about 23 per cent. of alcoholic extract, and about 0.5 per cent. of total alkaloids.

There seems no good reason why such a product should not be entirely suitable for practically all purposes for which belladonna is marketed. If such is the case there would appear to be full justification for increasing the percentage of stems allowed to 20 per cent. provided it is not made possible thereby to increase the foreign matter to a similar extent. Instead of stating that the herb should be "without the presence or admixture of more than 10 per cent. of its stems or other foreign matter," it would seem advisable to permit a maximum of 5 per cent. of foreign matter and to allow the presence of 20 per cent. of belladonna stems as a maximum.

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Bureau of Plant Industry,
U. S. Department of Agriculture,
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THE DETERMINATION OF MORPHINE IN COMPLEX PRODUCTS.

Part III. Opium and Mixtures Containing Opium.

By Alfred Tingle, Ph.D.

Introduction.

The very large number of methods which have been proposed for the determination of morphine in opium is in itself a strong argument that a reliable one is yet to be sought. Moreover, not one of these is capable of simple extension to cover combinations other than opium itself. Even when used on such closely allied derivative as a tincture or fluid extract, a new set of arbitrary corrections must be empirically determined and introduced into the calculation of the results.

To apply such methods to mixtures of unknown composition would be out of the question on that account alone. Further, they cannot be applied to pills containing some of the excipients mentioned in Part II of this communication, as the resulting mixtures would be colloidal suspensions which could neither be filtered nor even dealt with by decantation.

Many of the methods proposed, and even in common use, are necessarily inaccurate, in view of our more recent knowledge of opium. For instance, L. Debourdeaux (*Bull. Sci. Pharmacol.,* 1910, XVII, 382–385) has shown that as much as 10 per cent. of the morphine in opium is in a form insoluble in water and alcohol, and only to be rendered soluble by an alkali or alkaline earth. Thus the method laid down in the United States Pharmacopœia is quite vain.

Of those methods which direct that morphine be extracted by lime, that of Douzard (*Pharm. J.*, 1903 [IV], 17, 909–910) is a popular one. It suffers from a fundamental error in reckoning that 1 Cc. of $\frac{N}{10}H_2SO_4 = 0.0283$ gramme of anhydrous morphine. Reference to experiments 1 and 2 in Part I of this communication will show that the figure derived directly from theory is correct.

An objection against all methods in which lime is used is that while aliquot parts of the extract are taken for the determination, these are reckoned on a basis other than that of their relation to the water known to be present: instead of the mixture of opium, lime, and water being made to a measured volume, it is a measured volume of water which is added. An irregularity in the amount of water previously present, or formed in the reaction, will thus produce a corresponding error.

In all these methods, the morphine is precipitated in the presence of alcohol, and sometimes the proportion of alcohol is large. The magnitude of the errors to which this gives rise is fairly well known, and is again displayed in Experiments 8, 9 and 10, Part I of this communication. Many standard methods introduce fixed corrections to meet this loss. Douzard (*loc. cit.*) adds 0.05 Gm. of anhydrous morphine to the amount found by titration in a reputed 4 Gm. of opium, *i. e.*, 1.25 per cent. Stevens (*Pharm. Arch.*, V, 41–45) adds 1.12 per cent. to the percentage of crystallized morphine found by his titration. The British Pharmacopœia does not specify a correction, but admits a possible error of — 1 per cent.

In the latter case, even if the solvent effect of alcohol and ether be disregarded, the loss through water alone (of which 104 Cc. is present) cannot be less than 0.65 per cent. as shown in Part 1, Experiment 12.

"Corrections" of this order of magnitude, which represent about 10 per cent. of the morphine present in average opium, must give rise to grave doubts of the accuracy obtained. Furthermore, it makes it impossible to use such methods when the percentage of morphine is small, and analyses of opium are on record showing as little as 2 per cent. of morphine. The writer himself has examined a sample of smoking opium which gave no morphine when submitted to the United States Pharmacopœia method of estimation, so small was the actual proportion and so great the errors of the procedure. Yet this sample was obtained from an illicit dealer whose product was reputed to be stronger and purer than that of the shops licensed by the Chinese government.

It is not easy to see why such a state of affairs with respect to the assay of opium and the determination of morphine in opium products has been allowed to continue. That existing methods are intended for trade purposes only is not an answer, since it is for trade purposes that some of our most accurate analytical methods in other fields have been designed. Morphine has so high a value commercially that its accurate determination must be financially important. Yet it seems as though a lower standard than should be allowed has hitherto been set. Betterment is demanded both in the interests of business enterprise and by scientific pride.

In the present work the writer has been urged by necessities rising from successive official positions which he has held. The results here presented do not constitute a complete solution of the problem, but they appear to approach nearer to that end than any yet brought forward.

PRINCIPLES OF THE PROPOSED METHOD.

The manner of determining morphine described in Part II of this communication cannot be applied to opium and its preparations, since the extraction by a chloroform-alcohol mixture would separate resinous matter, some of which has a basic character, with the morphine. This resinous matter also accompanies the morphine when the latter is precipitated from alkaline solution by the addition of an ammonium salt, unless alcohol be present, in which case a serious loss of morphine occurs. But a great part of this resin is precipitated on cooling after the aqueous solution containing it has been digested with salicylic acid. This procedure does not affect the morphine, but is not in itself a complete purification. The alkaloid must be precipitated from a concentrated solution in the presence of chloroform, no alcohol being used; it is then further purified by re-solution and extraction with a chloroform-alcohol mixture.

The only necessary cause of loss in the whole process is the precipitation, and the extent of such loss is much less than in other methods. The chemical justifiability of each step can be seen by reference to the data collected in Part I of this communication.

The method now to be set forth can be applied equally well to dry or moist opium, to opium ash (so often a constituent of Chinese pills for the "cure" of the opium habit) or to complex pills containing these substances. The exceptions to this statement arise from the presence of "interfering" compounds, usually inorganic, and with ordinary ingenuity such exceptions can be met by slight elaborations of the procedure. Such a case is that of "Dover's Powder," the examination of which is detailed under Experiment 38.

Since calculation of the results involves no consideration but that of the obvious stoichiometrical relations, no special factors are used.

DETAILED DESCRIPTION OF THE METHOD.

A convenient weight for the sample is 6 Gm. This is placed in a flask graduated to contain 100 Cc. and is digested for 10 minutes on the water bath with 2 Gm. (approximately) of calcium carbonate and enough water to form a thin paste. While warm, the flask should be lightly closed with a rubber stopper. After digestion, the flask is cooled, and 60 Cc. of a cold saturated solution of barium hydroxide is added. The flask, now closely stoppered, is well shaken at intervals. After 20 to 30 minutes water is added to bring the total volume to 100 Cc. The solution is filtered through a dry 15 Cm. paper, and an aliquot portion of the filtrate (50 Cc.) is transferred to a flask graduated to contain 55 Cc. [meantime the residue on the filter may be examined for meconates as described in Part II].

Sulphuric acid (diluted 1:5) is added by drops till the solution is faintly acid and no more precipitate forms, the flask being warmed on the water bath to promote settlement. The solution is next made faintly alkaline by the cautious addition of concentrated sodium hydroxide solution. Salicylic acid is next added, in crystals, till acidity is restored, the flask being warmed after each addition to induce rapid solution of the acid. When an acid reaction has developed, the further quantity of 0.5 Gm. of salicylic acid is added and the flask is heated for 10 minutes by immersion in boiling water. It is allowed to cool to normal temperaure, and enough water is added to bring the contents to 55 Cc. The liquid is filtered through a dry 7 Cm. paper, and an aliquot portion of the filtrate (preferably 50 Cc.) is taken for further operations.

The clear solution is evaporated on the water bath (best in a platinum dish) almost to dryness. The dish is cooled and enough water is added to make the volume of its contents as nearly as possible 5 Cc. To this is added 5 Cc. of chloroform and about 3 drops of concentrated ammonium hydroxide solution or as much more as is needed to produce decided alkalinity. The liquids are well mixed with a stirring rod which is caused to scratch the bottom of the dish lightly and to break up undissolved aggregates, thus promoting rapid precipitation of the morphine. When the latter substance begins to separate the dish is covered and set aside for four hours, during which time it should be occasionally agitated with a rotary motion.

The contents of the dish are filtered through a cotton plug with the aid of suction, the dish and morphine being washed with small quantities of cold water (morphinated water may be substituted at the analyst's discretion) till the washings become colorless. About 10 Cc. of water, if care is used, should suffice for this washing, in most cases.

The morphine thus obtained is yellowish and not pure enough to give reliable results on titration. The plug with adherent alkaloid is lifted into a small separating funnel. The morphine remaining in the dish is dissolved in a small quantity of dilute sulphuric acid and the solution is transferred to the separating funnel through the funnel previously used for the filtration. The dish and funnel are then well washed with water. Washings and acid together should not exceed 20 Cc.

The solution of morphine is made sufficiently alkaline to liberate all the alkaloid by the addition of either a few drops of concentrated ammonium hydroxide or a saturated solution of sodium hydrogen carbonate. It is then shaken for 3 minutes with 25–30 Cc. of chloroform-alcohol mixture (2 volumes of chloroform to 1 volume of alcohol). After separating the lower layer of liquid, the extraction is exactly repeated on the aqueous layer with three further similar quantities of the chloroform-alcohol mixture, the time of shaking being 3 minutes in every case.

The combined extracts are distilled on the water bath. The residue of almost white morphine is dissolved in a known volume of decinormal sulphuric acid, the excess of which is titrated with decinormal or twentieth-normal sodium hydroxide. Lacmoid, cochineal or methyl orange are suitable indicators.

The weight of morphine found by this titration will be 10/22 of that present in the original 6 Gm. sample, if the aliquot parts taken were those recommended above.

REMARKS.

The weight of sample and the particular relative magnitude of the aliquot parts chosen may be varied accordingly to the circumstances of the case, but the above-mentioned quantities have proved generally convenient. It is important to note, however, that at the outset more than half the total volume of liquid used should consist of cold saturated barium hydroxide solution, and the morphine should be precipitated, in the later stage, from the most concentrated solution possible.

Even under the most favorable conditions some morphine will remain in solution, after precipitation of the main quantity. If it is desired, a correction ($+ 0.26$ Cc. $\frac{N}{10}$ acid) derived from experiment 11 (Part I) may be made to the titration result. In such case it is necessary to adhere strictly to the conditions of precipitation and washing here laid down. There are decided objections to making such corrections, and probably they are best omitted. The relative importance of this error may be reduced by increasing the weight of sample worked with.

COMPARISON WITH OTHER METHODS.

Since the results given by most standard methods must be considered uncertain to at least the extent of 0.5 per cent., serious comparisons are somewhat lacking in interest.

The opium used in Experiments 31, 32 and 33 was, however, examined by the method of Stevens (*Pharm. Arch.,* V, 41–45) modified by doubling the quantities specified by him. The result thus found was 10.42 per cent., which is materially less than that given by the experiments quoted.

It must be remembered that extraction by barium hydroxide is likely to be more thorough than by lime, while the analytical losses in the new method are notably less.

EXPERIMENTAL DATA.

Examination of Opium. Experiment 31[1].—The material used purported to be a Persian opium. A sample of 6.0000 Gm. was treated according to the method described above, the volumes of liquid employed being those there mentioned. The morphine found by titration was therefore 10/22 of the whole, or that present in 30/11 Gm. of opium.

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[1] These experiments are numbered consecutively with those in Parts I and II.

TITRATION RESULTS.

Total acid used = 26.00 Cc.
Acid equivalent to the alkali = 15.65 Cc.
Acid equivalent to the morphine = 10.35 Cc.
Since 1 Cc. acid = 0.0300 Gm. $C_{17}H_{19}NO_3 \cdot H_2O$ crystallized morphine found . = 0.3105 Gm.
= 11.3 Per Cent.

Experiment 32.—This was a check determination, duplicating Experiment 31.

TITRATION RESULTS.

Total acid used = 25.00 Cc.
Acid equivalent to the alkali = 14.71 Cc.
Acid equivalent to the morphine = 10.29 Cc.
Crystallized morphine found = 0.3087 Gm.
= 11.32 Per Cent.

Experiment 33.—The material used was the same, but the method of operation differed in two details. (1) Salicylic acid was used in larger quantity (2 Gm. excess instead of 0.5 Gm. previously taken), and (2) the volume taken of the filtrate from the barium sulphate was only 45 Cc. The morphine found by titration thus represented only 9/22 of the whole amount in the original sample.

TITRATION RESULTS.

Total acid used = 25.00 Cc.
Acid equivalent to the alkali = 15.58 Cc.
Acid equivalent to the morphine = 9.42 Cc.
Crystallized morphine found = 0.2826 Gm.
or = 11.51 Per Cent.

Experiment 34.—This determination was made upon material believed to be of Indian origin. The method used and quantities taken were the same as in Experiments 31 and 32. The determination was made in duplicate.

TITRATION RESULTS.

	I.	II.
Total acid used	= 25.00 Cc.	25.00 Cc.
Acid equivalent to the alkali	= 14.71 Cc.	14.51 Cc.
Acid equivalent to the morphine	= 10.29 Cc.	10.49 Cc.
Corresponds to grammes of crystalline morphine	0.3087	0.3147
or crystalline morphine in whole	11.32 Per Cent.	11.54 Per Cent.

Examination of Smoking Opium. Experiment 35.—The material under examination was smoking opium which had been allowed partly to dry in the air. In consequence of the superficial drying it was difficult to obtain two samples which were true duplicates. This difficulty was overcome by taking a single large sample, which was weighed into a tared beaker, dissolved in warm water and washed into a graduated (250 Cc.) flask. After cooling, 150 Cc. of cold saturated barium hydroxide solution was added, and the mixture made to the mark with cold water. It was allowed to stand 20 minutes and filtered. Two portions of 50 Cc. each were taken from the filtrate, and the analysis of each was continued independently by the method used in Experiment 31.

Total weight of opium taken = 16.4180 Gm. Weight corresponding to each 50 Cc. of alkaline solution = 3.2836 Gm.

TITRATION RESULTS.

	I.	II.
Total acid used	= 25.00 Cc.	25.00 Cc.
Acid equivalent to the alkali	= 13.75 Cc.	13.85 Cc.
Acid equivalent to the morphine	= 11.25 Cc.	11.15 Cc.
Corresponds to grammes of crystalline morphine	0.3375	0.3345
or crytalline morphine in whole	11.30 Per Cent.	11.20 Per Cent.

A determination of water in the above opium was subsequently made.

Weight of moist sample	2.3116 Gm.
Weight of dried sample	1.9196 Gm.
Weight of water found	0.3920 Gm.

The above corresponds to 16.95 per cent. water, which is considerably less than is found in opium freshly prepared for smoking.

From the above results the mean morphine content of the dry product would be 13.55 per cent.

Examination of "Opium Ash" or "Opium Dross" (Ta Yen Hui). Experiment 36.—The method of analysis applied to the foregoing samples was used in this case on a sample of opium ash. The details of the operation exactly resembled those of Experiment 31. It may be remarked that, though opium ash contains so much resinous matter, the morphine for titration appeared as pure as that obtained in the same way from opium itself.

TITRATION RESULTS.

Total acid used = 25.00 Cc.
Acid equivalent to the alkali = 17.71 Cc.
Acid equivalent to the morphine = 7.29 Cc.
Corresponds to 0.2187 Gm. crystalline morphine or 8.02 Per Cent.

Examination of Pills containing Opium, such as might be sold "For Curing the Opium Habit." Experiment 37.—The sample was made up of 5.4 Gm. of Chinese pill mass and 0.6000 Gm. of the same opium as that used in Experiments 31, 32 and 33.

TITRATION RESULTS.

Total acid used = 10.00 Cc.
Acid equivalent to the alkali = 9.25 Cc.
Acid equivalent to the morphine = 0.75 Cc.
Corresponds to 0.0225 Gm. of crystallised morphine or 0.82 Per Cent.

Calculated from the mean result of Experiments 1, 2 and 3 the result should have been 1.14 per cent. or 0.32 per cent. higher. The precipitate, produced at the beginning of the analysis by the addition of barium hydroxide, was washed into a casserole and acidified with an excess of hydrochloric acid. After boiling for a few minutes the product was filtered. This filtrate was concentrated to a convenient volume and tested with ferric chloride solution. It gave the color characteristic of meconic acid very distinctly.

Examination of "Dover's Powder." Experiment 38.—The same method of determining morphine was applied to "Dover's Powder" with such modification as becomes necessary when a large proportion of sulphates is present in the material under examination.

The Dover's Powder used only differed from the "B. P." preparation in that the opium was slightly above the official strength. The mixture was composed of 4.8000 Gm. of potassium sulphate, 0.6000 Gm. of powdered ipecacuanha root, and 0.6000 Gm. of the opium used in Experiment 31. Total weight of mixture 6 Gm.;

morphine 1.14 per cent. This was placed in a graduated (200 Cc.) flask and digested on the water bath with 20 Cc. of water for 10 minutes. An aqueous solution containing 9 Gm. of barium chloride was added, followed by 120 Cc. of a cold saturated barium hydroxide solution. After standing 30 minutes the mixture was diluted to 200 Cc. The remainder of the determination was carried out in the manner already described, but 100 Cc. was substituted for 50 Cc. and 110 Cc. for 55 Cc. when taking an aliquot part and later diluting.

TITRATION RESULTS.

Total acid used = 10.00 Cc.
Acid equivalent to the alkali = 9.27 Cc.
Acid equivalent to the morphine = 0.73 Cc.
Corresponds to 0.0219 Gm. of crystalline morphine, or 0.80 Per Cent.

Calculated from Experiments 31, 32 and 33, the result should have been 1.14 per cent., *i. e.,* 0.34 per cent. higher.

Titration with acid of anything like decinormal strength is obviously not a suitable method for the accurate determination of such small amounts of morphine as were present in this case and in Experiment 37, but it serves sufficiently to show how far the present method of separating morphine can be applied.

If the correction mentioned on p. 856 be applied to Experiments 31, 32, 33, 37 and 38, we get figures in closer agreement, as follows.

Experiment 31.	Morphine	11.67 Per Cent.	Mean	11.70 Per Cent.
" 32.	"	11.60 Per Cent.		
" 33.	"	11.83 Per Cent.		
" 37.	"	1.10 Per Cent.	Calculated	1.17 Per Cent.
" 38.	"	1.09 Per Cent.		

ACKNOWLEDGMENT.

In the course of this work, which was commenced in China in 1909, I have received direct and indirect help from friends and colleagues too numerous to mention, but notably from Mr. F. W. Babington, chief analyst in this laboratory, Mr. Allan A. Ferguson, at one time a member of its staff, and Hu Ch'ing T'ang.

Without the unfailing kindness, consideration, and helpfulness of the former, the work could not have been continued. Mr. Ferguson assisted with many experiments under my supervision: none of

them are recorded here, but they opened the way for later work. The services of Hu Ch'ing T'ang were invaluable in earlier days, especially in the collection of curious material, and to him I owe much of my knowledge of the intricate ways of opium dealers (legal and illicit) of China, and my appreciation of the problems these cause to be presented. To these and to others not named, I wish to render my grateful thanks.

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OTTAWA.

HAZLITT ON THE METRIC SYSTEM.

BY JAMES F. COUCH.

English thinkers have, as a general rule, always been opposed to the adoption and use of the metric system in spite of its, to us, obvious advantages over the cumbrous and time-wasteful inch, pound, gallon, measures in use by Anglo-Saxon countries. The obstinacy with which they reject efforts to substitute the metric for the English system must be due, in large part, to native prejudice and conservatism which rejects innovations that appear experimental and resists, through intellectual inertia, all fundamental changes in the established order of things. Unfortunately, from its very nature, the metric system must be adopted by any people in its entirety at one time: in a moment there must be a change from the old system to the new, a revolution which cannot help but cause confusion in practically all the industries. The metric system does not admit of a gradual adoption, replacing the English system little by little and so permitting the great mass of business men and traders to become accustomed to it in the slow method by which most great revolutions in human thought and activity are brought about.

Over a decade ago the views of Herbert Spencer,[1] that giant of British intellectuality, were published in this journal by Florence Yaple. In that paper Spencer presents what is probably the strongest case against the metric system ever written. I wish to quote here the argument against the metric system advanced by another British philosopher because it considers the case from an entirely different aspect and one which is more likely to affect the people than the point of view taken by Spencer.

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[1] This JOURNAL, 76, 125–128.

William Hazlitt was born at Maidstone, England, on the tenth of April, 1778, and died on the eighteenth of September, 1830. He was thus, as Spencer was not, a contemporary of the changes in France which brought about the introduction of the metric system. His reputation was founded on many literary, historical, and philosophical essays. His style is vigorous; his thought clear; his attitude strongly tinctured by prejudices. The following quotation is taken from his "Life of Napoleon Buonaparte," Chapter 15, page 375.

"Nothing renders a government unpopular or excites hatred and contempt sooner than a disposition to interfere in trifles, and without any reason but the itch of governing. The new system of weights and measures was another grievance complained of. The want of uniformity in French weights and measures was an inconvenience that had long been felt; and it was expected among other things that the revolution would have corrected this evil. The remedy was in fact simple and at hand; it was to render the system of weights and measures in use in the city of Paris, and which had also been employed by the government and artists for centuries, common throughout all the provinces. Instead of this, the government, who at that time did everything on a grand scale of abstraction, consulted the algebraists and geometricians upon a question of practical utility who soon hit upon a system which neither agreed with the regulations of the public administration, with the tables of dimensions used in all the arts, nor with those of any of the existing machines. Nor would other nations have agreed to this, which was meant to be a universal benefit to the world. What would the English, for instance, have said to it? The new system not only was at variance with common sense and custom, and required all the calculations of the arts and sciences to be reversed, but was in itself impracticable and unintelligible. It converted the commonest affairs of life into an abstruse mathematical calculation. Thus a soldier's ration is expressed by twenty-four ounces in the old nomenclature; this is a very simple process; but when translated into the new one, it becomes seven hundred and thirty-four grammes and two hundred and fifty-nine thousandths. All the dimensions and lines that compose architectural works, all the tools and measures used in clock making, jewellery, paper making, and the other mechanic arts, had been invented and calculated according to the ancient nomenclature, and were expressed by simple numbers, which must now be represented by five or six figures. Another disadvantage was that the savants introduced Greek roots, which farther multiplied difficulties; for these denominations, though they might be useful to the learned, only perplexed the common people. But the Directory made the weights and measures one of the principal affairs of government. Instead of leaving it to time to work the change, and merely encouraging the new system by the power of example and fashion, they made compulsory laws and had them rigorously executed. Merchants and artisans found themselves harassed about matters in themselves indifferent; and this increased the unpopularity of a government which placed itself above the wants and the reach of the people, infringing on their habits and usages with all the violence which might be expected from a Tartar conqueror. It is always bad policy in a government to meddle more than it can help with the affairs of private life, which individuals understand so much better than mere theorists, thus subjecting itself at once to the charge of meanness and incapacity."

The above quotation requires little comment. The history of the French people since the introduction of the metric system, the progress of their industries, the extensive and intelligent use of the system by the poorest and most unlettered in the land are abundant refutation of Hazlitt's invective. Yet, when from the earliest days of the new weights and measures, Englishmen have been accustomed to reading such reports of the metric system, when they have, we imagine with incredible labor, mastered the intricacies of their system of coinage and learned to multiply and divide pounds, shillings, and pence it is not to be wondered at that they refuse to be dislodged from a position acquired by so many pains, in favor of one which appears seductively simple, but whose very simplicity is cause for suspicion! And to change would be to confess the inferiority and undesirable complication of their own system which anyone who understands the English character will readily appreciate the hopelessness of persuading an Englishman to do.

GROWING MEDICINAL PLANTS IN AMERICA.[1]

By Allerton S. Cushman, Ph.D.,

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Modern warfare may be roughly divided into two distinct phases: one is destructive and the other reconstructive. There are no longer crucial battles which decide the issue of war as at Waterloo or Gettysburg, but there is instead one protracted and unceasing effort to destroy the enemy's life and property on the largest scale possible. Nevertheless, the reconstructive work must follow the destructive on an equally gigantic scale. Never before in the history of mankind has such organization existed for the first-aid and subsequent treatment of the sick and wounded, and never before has there been such concentrated human and animal suffering calling for alleviation.

It is a curious dispensation of Providence that man first found, and still to a very large extent depends for his remedial and anæsthetic agencies on the familiar herbs and weeds which grow wild about his woods, fields and hedgerows. The term "drug" includes all substances used as medicines, as well as those substances which may be misused as intoxicants or anæsthetics. Drugs may be mineral, such as the bromides, iodides, and chlorates of potassium, the mercurial, arsenical, and silver compounds and many others. In addition to these, modern medicine depends largely on the coal-tar derivatives, among which may be mentioned some of the more familiar, as, for instance, acetanilid, phenacetin, and the various salicylates, under such trade names as aspirin and salol, owned and exploited before the war exclusively by the Germans. The present paper, however, concerns itself particularly with the raw materials from which such medicinal agents as the alkaloids and glucosides are extracted. These are represented by morphine, cocaine, strychnine, atropine, quinine, digitalin, strophanthin, aloin, etc., which are extracted from crude drugs imported into this country from overseas.

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[1] Presented at the stated meeting of the institute held Wednesday, April 17, 1918. Reprinted from the *Journal of the Franklin Institute,* September, 1918.

It is, however, more particularly the botanical drugs which can be grown under proper scientific control in the United States which we shall consider. Among these we find the following important medicinal plants: Aconite, belladonna, and stramonium, the principal source of atropine, digitalis (foxglove), cannabis indica or Indian hemp, the active principal of which is known in India as hashish, the properties of which the elder Dumas so beautifully misdescribes in "The Count of Monte Cristo."

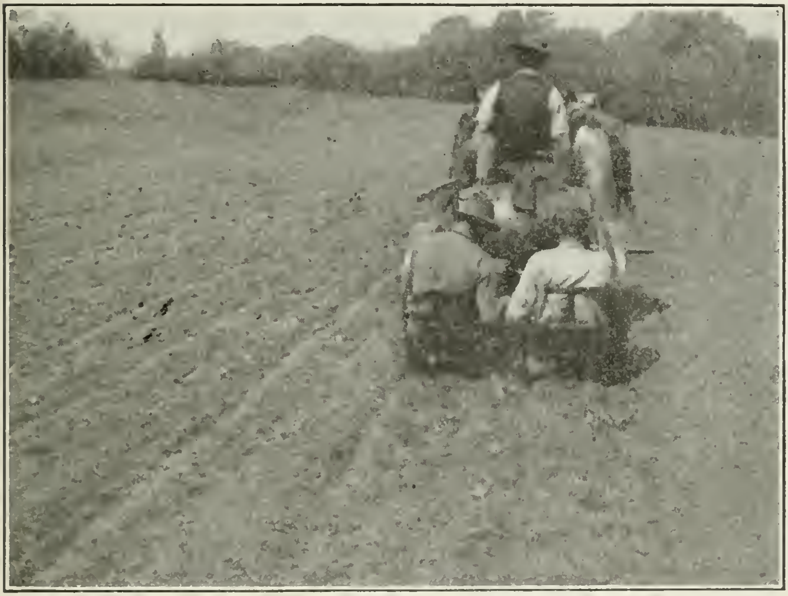

FIG. 1. Planting belladonna seedlings at the rate of sixty to the minute.

Among our native medicinal plants we also use in fairly large quantity henbane, rhubarb, senna, gentian, golden seal (hydrastis), senega, mandrake, bloodroot, arnica; ajowan seeds, and monarda punctata, used in the manufacture of thymol, a specific in the treatment of the hookworm disease, and many others too numerous to mention. If a layman, unaccustomed to the study of such subjects, were to pick up one of the great New York commercial daily newspapers which quote prices in the drug markets and were to glance over the items quoted he would probably be very much astonished at the familiar herbs, roots, and flowers which are made a matter of almost daily barter and sale, and manifold uses of which constitute some of the mysteries of our enormous patent medicine industry. There are warehouses in the heart of New York City filled with great bales of things familiar to our childhood days: cornsilk, daisy tops, red clover tops, laurel leaves, skunk cabbage, flagroot, burdock, dandelion, gentian, lily-of-the-valley, wintergreen, and many another of our old friends of the fields and woods. The inquirer might also be surprised to learn that these familiar things command a price varying from cents to dollars per pound and he might even solemnly determine to turn his newly acquired knowledge to profitable purposes and forthwith embark in the combination of business and pleasure of producing and purveying herbs and simples. Unfortunately, however, for this laudable ambition, it would soon become apparent that the labor involved, for instance, in gathering two bales of green corn silk or something else which shrinks to one bale on drying is quite inadequately paid for by the prices offered by the stony-hearted buyers in the New York market. In fact, it would

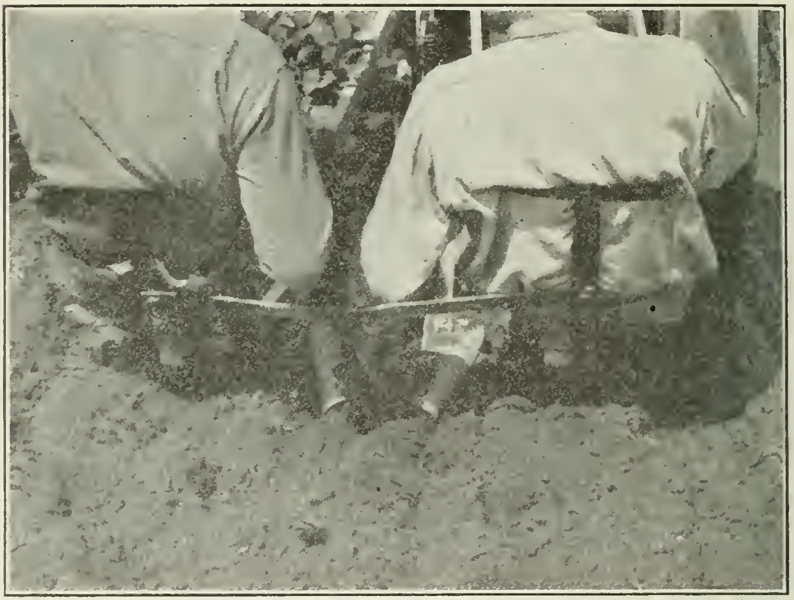

FIG. 2. A close up view of the two-man planter by means of which belladonna seedlings are set out.

probably be learned that, although America produces more corn silk or something else than all of the rest of the world together, from time out of mind the baled corn silk or something else has been imported from overseas where child-labor laws are unknown and where people's wives, mothers, and grandmothers are more interested in acquiring a few extra pennies a day by working in the fields than they are in acquiring a vote.

Seriously speaking, the production of medicinal herbs in America depends very largely on the labor cost, and can be made a profitable enterprise only when it is conducted on a scientific basis and on a sufficiently large scale to absorb the high cost of the labor involved in the tilling, planting, cultivating, harvesting, curing, and packing operations. At the same time, the drug grower faces a most uncertain and precarious market for his wares, for, although his drug plants are needed, the need is strictly limited, and the slightest overproduction is either entirely unsalable or salable at a price less than the cost of production.

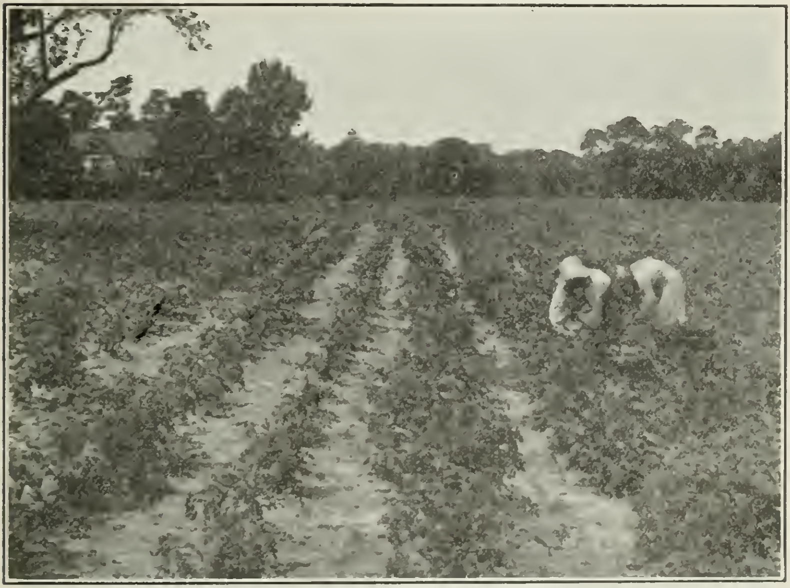

Fig. 3. A seven acre field of belladonna ready for the first harvest.

A well-known authority on drug growing, Mr. H. C. Fuller, has recently said in effect: "The cultivation and marketing of drugs must be done under an entirely different set of conditions than those obtaining in the growing and selling of vegetables. Much that has been published on the subject is misleading, and the idea that the ordinary farmer can successfully grow drug plants and produce a marketable article is ridiculous. It can be confidently asserted that if the ordinary farmer should undertake the growing of drug plants it would result in failure to him as well as discredit to the efforts of those who are specializing in the subject."

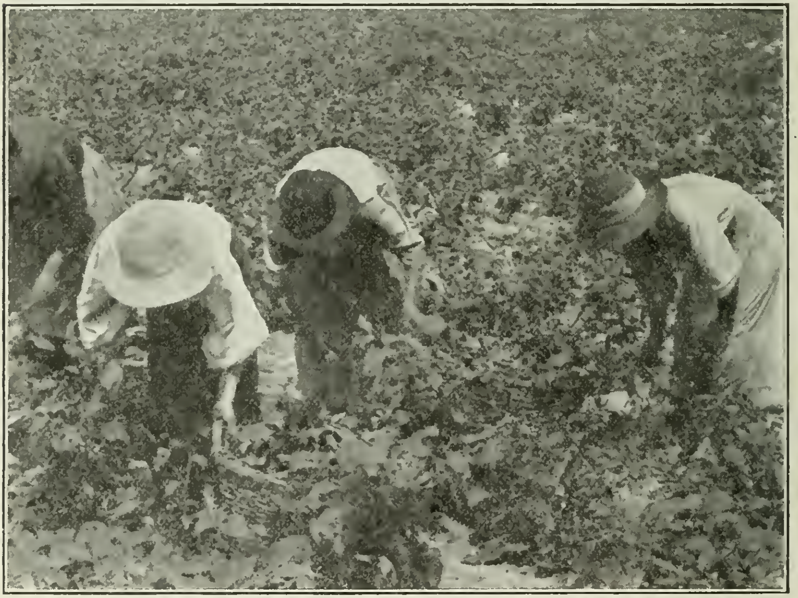

FIG. 4. Women harvesting belladonna leaves.

Dr. W. W. Stockberger, the Expert of the United States Department of Agriculture, in charge of drug and poisonous plant investigations, expresses the same fact in the following words:[2]

"If medicinal plant cultivation is to succeed in this country it must be placed on a sound commercial basis, and there are good reasons for believing that this end will not be attained by encouraging a large number of persons to engage in drug growing on a small scale." . . . "If the drug manufacturer is to become permanently interested in medicinal plants produced in this country he must be assured of a fairly large and dependable source of supply. For this reliance must be placed upon well-equipped growers who have sufficient capital to carry on the enterprise effectively."

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[2] *The Druggists' Circular,* January 18, p. 5; *ibid.,* March 18, p. 106.

Still another writer on this subject has recently published the following comments:[3] "In the strictly pharmaceutical field the shortage of crude drugs has been felt more or less keenly since 1914, and much misinformation and little information of value have been circulated on the subject. Stocks of many crude drugs have been exhausted, and the cultivation of medicinal plants has not as yet assumed any great proportions in the United States. Those drugs which were obtained from Europe were not cultivated, but grew wild there. It was therefore a simple matter to have them gathered and prepared for market at comparatively small cost. The cultivation of medicinal plants in the United States requires expert labor, the production of artificial conditions of soil and moisture in order to provide as nearly as possible the conditions under which

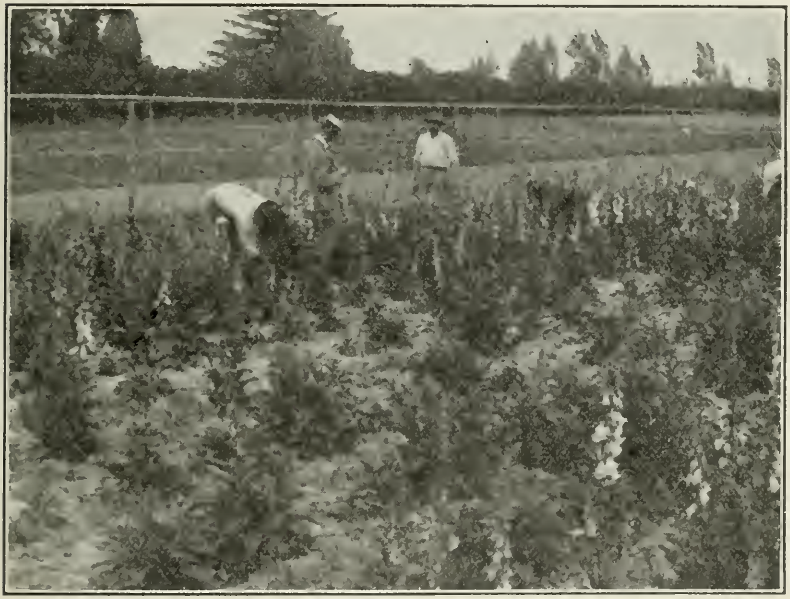

Fig. 5. Harvesting digitalis leaves.

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[3] *Journal Franklin Institute*, vol. 185, No. 3, p. 435.

the plants grow in their native habitat, and considerable investment of money. Drug plants have been raised on an experimental scale by the government and in the drug gardens of various colleges, but it is a very different undertaking to raise them on a commercial scale. American growers of crude drugs were confronted with the necessity of increasing the value of the plants in order to overcome the high cost of cultivation. It was soon found that cross-pollination would not produce plants containing more active constituents than they do normally, but by careful selection of seed it has been possible to increase the amount of active constituents in such plants as belladonna, digitalis, etc., to three of four times what the Pharmacopœia requires. Furthermore, advanced methods of harvesting these plants have made it possible to secure three or four harvestings in one season, whereas in former years one or two was the limit."

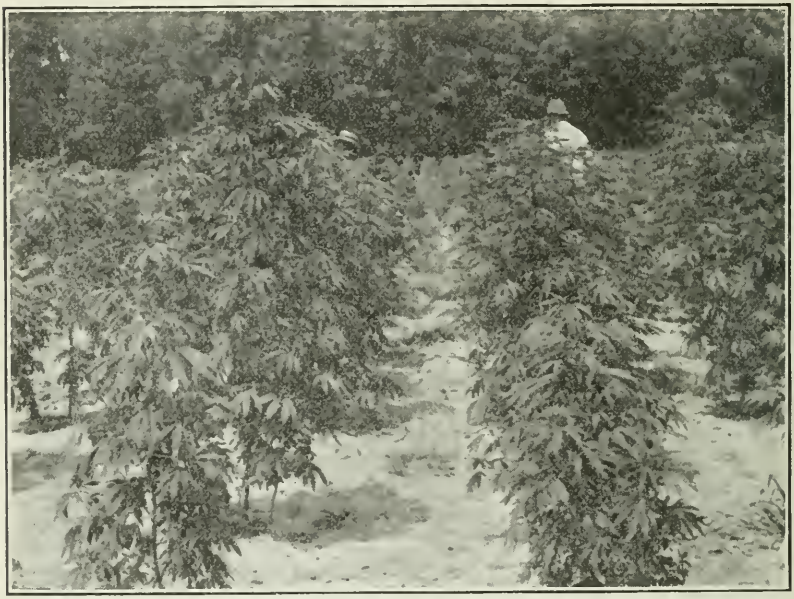

Fig. 6. A field of cannabis.

The experience gained by the author in the production of certain drug plants extending over the past three years confirms the statements of the experts quoted above. The fact is very clearly brought out that the so-called "backyard" movement, however much it may stimulate vegetable gardening and poultry raising, is not applicable to the growing of medicinal plants. The U. S. P. requirement for dry belladonna herb or leaf calls for an assay showing a content of not less than 0.3 per cent. atropine alkaloid. Any substantial quantity of active constituents in excess of this prescribed minimum should, if the producer is aware of it, be credited in the price paid by the consumer. The small producer can have no knowledge of the assay value of his product unless he employs the services of a chemical laboratory. Such chemical assays require special highly paid experts in order to obtain accurate results, and the cost of such service is naturally high. In the opinion of the writer, unless a producer is able to hold his belladonna to an assay value at least twice as strong as the U. S. P. requirement it would not be worth producing at all under American conditions. Such high-potency crude drugs can be obtained only by the application to the problem of trained scientific knowledge. Plant breeding through seed selection and a knowledge of just the day to harvest when the

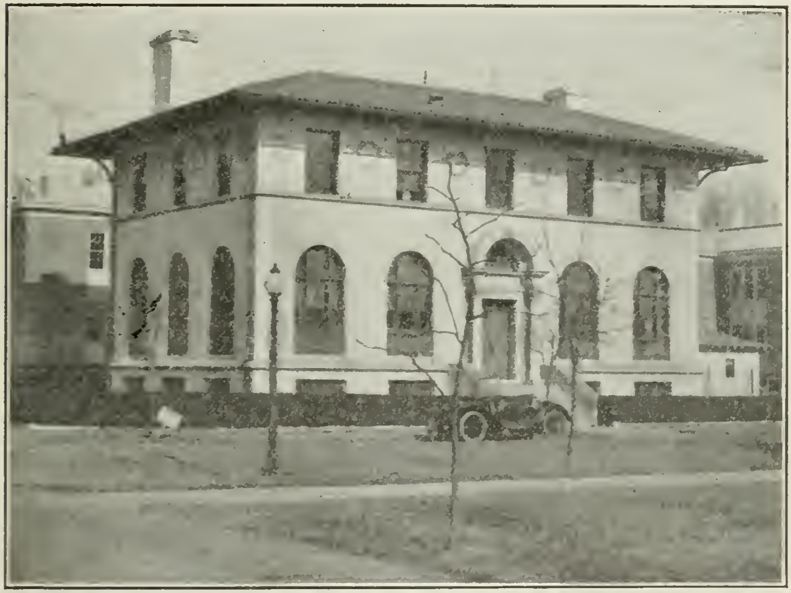

Fig. 7. The Institute of Industrial Research, Washington, D. C., where the drug plants are analyzed and tested.

alkaloidal content is at the maximum, together with proper control of the drying operations, constitute a large part of the secret of success. All this necessarily hangs upon the results of laboratory investigation, which must go on hand in hand with the agricultural operations. The author and his associates have produced belladonna in bulk running almost one per cent. alkaloid-atropin.

Other important medicinal crops, such as digitalis and cannabis, present a special problem, inasmuch as the active constituents are not determinable by chemical assay, but depend upon certain specific physiological tests which require the services of another group of trained specialists.

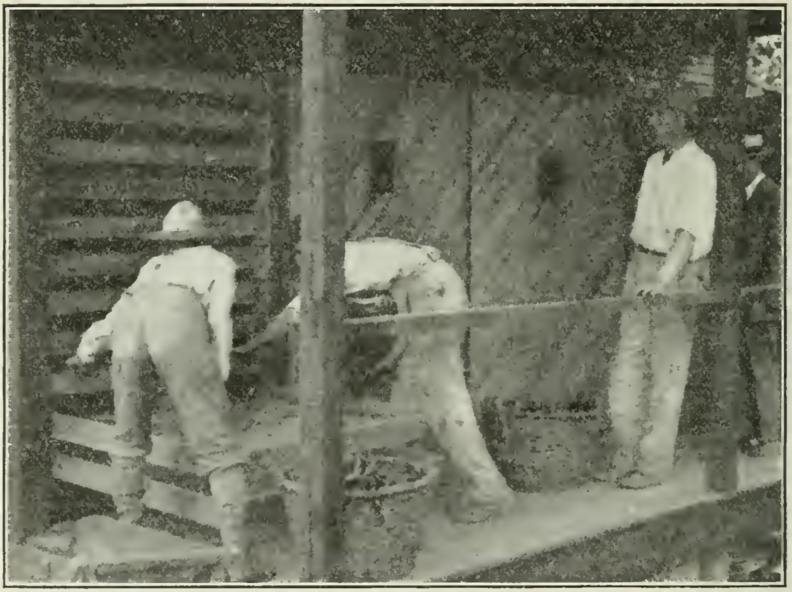

Fig. 8. Preparing to fill the dryer where the herbs and roots are cured.

In marketing crude drugs the pharmacopœial requirements must be met, no matter how irrational these may be. The requirement on cannabis calls for the dried flowering tops of unfertilized pistillate of female plants only. This specification requires that before the male plants pollinate experts must go over the entire crop, plant by plant, and distinguish and destroy every male individual. Immediately the visible crop shrinks approximately fifty per cent., and also adds to its cost of production the cost of this wholesale weeding operation. This requirement also necessitates the seed gardens being remote enough from the main crop to prevent wind-blown pollen from reaching the female survivors. In order to test the necessity for this requirement, the author, in coöperation with Mr. H. C. Fuller, gathered from the seed gardens flowering male tops, which were dried, powdered, and bottled. This sample, together with a pharmacopœial sample bearing distinguishing numbers but no other information, was sent to the physiological laboratory of the Harvard Medical School. The report showed the male sample was the more physiologically active of the two. Although the pharmacopœial requirement is probably a survival of some superstition originating in India, the drug-plant grower is held rigidly to it, and it is extremely unlikely that any buyer would purchase the crude drug in the powdered form, as the dried flowers must be present so that inspection will detect the presence of male plants. If such specifications are annoying to the commercial drug grower, they would be found intolerable by an ordinary farmer who might otherwise feel inclined to undertake the production of this special crop.

All medicinal plants are intensely poisonous to animals, but curiously enough, most of them are very attractive to predatory insects. Possibly insects share with man a weakness for certain things that would better be let alone. However this may be, the author has determined by actual experiment that the flea beetle consumes about five per cent. of every crop of belladonna grown, in spite of the most liberal use of insecticides and agricultural spraying machinery.

Henbane, the crude drug from which hyoscyamine is made, sells at about four dollars a pound on the dry basis, and is worth it, owing to the eagerness with which insects appear to lie in wait for every green shoot as it appears. In the course of the author's experience potatoes were grown in the neighborhood of henbane, in the hope thot it would act the part of a decoy crop. Unfortunately, however, the potato beetles preferred the henbane, and—if we may be permitted to drop into the vernacular—returned to their own homes only after all the other places were shut up.

Among the medicinal plants which the author and his associates have attempted to grow commercially in Virginia and Maryland, many of them successfully, are belladonna, digitalis, cannabis, sage, hydrastis, ginseng, stramonium, monarda punctata, pinkroot, valerian, senega, colchicum, etc. Of these, the first two have to be propagated in a greenhouse during the winter in order that the plants, when set out in the field, will be large and vigorous enough to cope with the ravages of insects and crowding out by weeds. The greenhouse soil has to be especially sterilized to prevent the spread of a special fungoid root-rot disease to which belladonna is especially susceptible and which follows the seedlings from the greenhouse to the open fields. During one season the writer lost over fifty per cent. of his belladonna crop, due to root-rot. So suddenly did the disease show iteslf that on one day the bushy plants, about two feet high, were flourishing in the field and the next day were found wilted down and dying. The roots of belladonna are rich in atropine and are usually dug up and sold after a succession of leaf crops have been gathered, so that the loss from root-rot is most discouraging and baffling.

Ginseng and hydrastis (golden seal) grow in leafy, shady woods and are much appreciated by field mice, which seem to feel that the crops are being grown for their exclusive benefit. Moles, although they do not appear to eat the roots, are most destructive and prefer to burrow along a line of valuable plants rather than go anywhere else. Ginseng is not used as a drug in any country except China, so, if grown, it is only for export. It is doubtful if, under present conditions, its cultivation can be carried on profitably in this country except by specialists in this crop.

This paper has not attempted to discuss drugs or drug growing in their technical aspects, but merely describes a few of the conditions and difficulties encountered by a group of associates who entered the field with no expectation of making large profits, but with the patriotic purpose of demonstrating, if possible, that American methods were capable of making us independent of central Europe with respect to some very necessary medicinals.

NUCLEIC ACID AND ITS ANALYTICAL EXAMINATION.[1]

By A. Chaston Chapman, F.I.C.

During recent years nucleic acid and certain of the metallic nucleates have found somewhat wide and increasing application in medicine, and particularly in connection with surgical practice. At the outbreak of war, these substances were obtained chiefly from Germany and America, and so far as I am aware were not manufactured at all in this country. A number of urgent enquiries having been received from France and elsewhere, the Pharmaco-Chemical Products Company, Ltd., suggested to me that I should undertake the investigation of this matter with the object of devising methods for the manufacture of pure nucleic acid and its derivatives on a large scale. Yeast was obviously the most convenient raw material, and for more than a year the above-mentioned company have been manufacturing considerable quantities of pure yeast-nucleic acid and its compounds.

It will be obvious that, in the prosecution of this work, it was necessary to have methods for examining the products obtained and to establish analytical *criteria* of purity. The production of pure nucleic acid on a large scale presents many difficulties, the two chief ones being the complete removal of protein and the prevention of the contamination of the acid with the products of its own decomposition. This will be at once apparent when it is remembered that nucleic acid results from the breaking-down of the nucleo-proteins of the cell nuclei on the one hand, and that, on the other, it yields, as the result of further hydrolytic change, a number of complex nucleosides and bases, together with phosphoric acid and the carbohydrate *d*-ribose. The conditions for hydrolysis have therefore to be very exactly determined and very strictly observed in practice.

Up to the present two nucleic acids have been very fully studied, the one derived from yeast, the other from the thymus gland. Whether these two acids represent typical members of two sharply defined groups, or whether all nucleic acids are identical with the one or the other, is at present a little doubtful. The latter view is, however, the one more generally held, and the nucleic acid from yeast is frequently known by the more comprehensive term "plant-nucleic acid." It is with this plant nucleic acid that the present paper chiefly deals.

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[1] From *The Analyst*, July, 1918.

The following statement shows at a glance the chief products of hydrolysis of these two nucleic acids, and at the same time affords an insight into their respective chemical constitutions:

Plant Origin.—Guanine, adenine, cytosine, uracil, *d*-ribose (pentose), phosphoric acid.

Animal Origin.—Guanine, adenine, cytosine, thymine, lævulinic acid (from a hexose), phosphoric acid.

Plant nucleic acid is a white friable substance devoid of odor or taste, and having the formula $C_{38}H_{50}O_{29}N_{15}P_4$. It is practically insoluble in water, but dissolves readily in solutions of alkaline acetates. It is also readily soluble in solutions of the alkalies forming the soluble alkaline salts. From these solutions a few drops of hydrochloric acid precipitate the nucleic acid in a dense curdy form, which dissolves completely on the addition of a large excess of the acid.

When acetic acid is added to a solution of the sodium salt, the acid is partly precipitated, but no precipitate is formed on the addition of any acid in the presence of a sufficient quantity of alkaline acetate.

When added to a solution of sodium nucleate, a solution of copper acetate acidified with acetic acid gives a bulky greenish-blue precipitate.

Calcium chloride in excess in the presence of a few drops of acetic acid gives a white precipitate at first flocculent, quickly becoming more granular.

Silver nitrate, when added in considerable excess to a fairly strong and neutral solution of sodium nucleate, gives a white gelatinous precipitate. On the addition of a little sodium chloride this dissolves, forming an opaque colloidal solution. One drop of hydrochloric acid added to this precipitates the silver as chloride.

Solutions of sodium nucleate in water exhibit a marked tendency to gelatinize, and, if sufficiently strong, set to a jelly.

The above reactions, coupled with the recognition of guanine and adenine (which are the most easily isolated and best defined of the bases formed on hydrolysis), suffice for the identification of nucleic acid, when it exists in a fairly pure condition.

For the hydrolysis of nucleic acid 10 grm. of the acid (or a larger quantity if available) are heated in a boiling water-bath for two hours with 40 Cc. of 10 per cent. sulphuric acid (or a proportionately larger quantity if more than 10 Gm. are taken) in a small flask fitted with an air condenser. At the end of this time strong ammonia is added to the hot solution in the flask until the liquid contains an excess of about 2 per cent. The guanine is precipitated in a granular form, the adenine remaining in solution. After filtering and washing with 1 per cent. ammonia, the guanine is dissolved in the smallest possible quantity of dilute sulphuric acid, decolorized if necessary by means of a little animal charcoal, and the base precipitated again from the colorless solution by the addition of an excess of ammonia. The purified base may then be converted into the hydrochloride, which crystallizes very readily and may be easily identified by the application of any of the well-known tests. The ammoniacal filtrate from the guanine, together with the ammoniacal washings, is acidified with sulphuric acid, heated to boiling, and the adenine precipitated as a cuprous compound by the addition of a 10 per cent. solution of copper sulphate. Inasmuch as the solution contains the carbohydrate ribose, it is not necessary to add sodium bisulphite for the purpose of reducing the cupric compound. The adenine-copper compound is suspended in hot water, decomposed with sulphuretted hydrogen, and the filtrate from the copper sulphide evaporated to dryness on the water-bath. The residue, consisting of nearly pure adenine, is dissolved in 5 per cent. of sulphuric acid, and the adenine sulphate, which is readily soluble in hot, but very slightly soluble in cold water, allowed to crystallize. The usual tests can then be applied.

The following is an outline of the procedure to be adopted for the examination of nucleic acid, with the object of ascertaining its purity and quality.

The acid should be white or at the most have a very faint buff color. It should be completely soluble in an aqueous solution of sodium acetate or in dilute solutions of ammonia or of sodium or potassium hydroxides. The solutions in these reagents should be bright and almost colorless. When a few drops of hydrochloric acid are added to a solution of the sodium salt in water, the acid should be precipitated as a white curdy substance, and on the further addition of a large excess of the hydrochloric acid this should dissolve completely. An aqueous solution of the sodium salt should give with cupric acetate, calcium chloride and silver nitrate the reactions described above.

TESTS FOR THE ABSENCE OF PROTEIN.

Biuret Reaction.—A solution of the acid in an excess of caustic soda should give, on the addition of one or two drops of dilute copper sulphate solution, a greenish-blue color with at the most a faint tinge of purple. This test is quite sufficient, but occasionally the following test is applied:

A 5 per cent. solution of nucleic acid in a small excess of ammonia, when heated in a bath at 105° C., should give at the most a slight turbidity.

In connection with these tests, it may be pointed out that the removal of the last traces of protein matter from nucleic acid involves a very troublesome series of treatments, and that acid of high commercial quality will usually give an indication of the presence of traces of protein when subjected to the above tests. The second of the above tests is the more severe, inasmuch as an amount of protein equal to not more than 0.1 or 0.2 per cent. (expressed on the acid) gives a very appreciable volume of precipitate.

Inorganic Phosphate.—To a solution of the acid in excess of ammonium or sodium acetate a few drops of acetic acid are added, and then a little uranium acetate. A flocculent precipitate is formed, which in the absence of more than a trace of inorganic phosphate should dissolve completely on boiling. A considerable excess of alkaline acetate is necessary in this test.

ESTIMATION OF NITROGEN AND ORGANIC PHOSPHORUS.

Nitrogen.—This is estimated by the Kjeldahl method in the ordinary way.

Phosphorus.—A weighed quantity of the acid is fused with six times its weight of sodium carbonate containing 10 per cent. of potassium nitrate. The fused mass is taken up with water, and in this solution the phosphoric acid is estimated either by the molybdate method or by direct precipitation with magnesia mixture in the presence of a little ammonium citrate.

It will be seen that the formula given above corresponds with 16.1 per cent. of nitrogen and 9.5 per cent. of phosphorus.

Commercial nucleic acid of good quality ought to contain not much less than 15 per cent. of nitrogen and 9 per cent. of organic phosphorus (expressed on the moisture-free sample). The examination of nucleic acid should always include these two items, and the ratio of the percentage of organic phosphorus to that of nitrogen is one of the best *criteria* of the purity of the acid, since, if this ratio (1 : 1.7) is approximately correct, the presence of any appreciable proportion of the products of hydrolysis is excluded.

THE MANUFACTURE OF CHLORAMINE–T.[1]

By J. K. H. Inglis.

Although two years have elapsed since Dakin showed the value of chloramine-T as an antiseptic, no detailed account of the method of manufacture has yet been published. The drug has shown itself of great value in cases of cerebrospinal meningitis, diphtheria, etc., and after a trial of a small specimen which I had made, I was asked to supervise the manufacture of a regular supply for the military camps in New Zealand, it having been found impossible to procure it outside the Dominion.

In Dakin's work the starting point for the preparation was *p*-toluenesulphonic chloride, obtained as a by-broduct in the manufacture of saccharin. No such material being available in New Zealand, details had to be worked out for the manufacture from toluene itself, and these details form the material for this paper.

Sulphonation.—The sulphonation of toluene with concentrated sulphuric acid leads to the formation of the three possible monosulphonic acids; but the higher the temperature the larger the proportion of *p*-acid (Ber., 1911, p. 2504), the highest proportion being 70 to 80 per cent. The price of sulphuric acid being relatively high in New Zealand, I found it best to use two parts by weight of sulphuric acid (sp. gr. 1.84) to one part of toluene (approximately equal volumes) and to carry out the sulphonation at the boiling point of toluene. 250 Cc. of sulphuric acid (1.84) is heated to 110° C. by immersing the reaction flask in a heated paraffin bath, and then 250 Cc. of hot toluene is added, the whole being very vigorously stirred with a glass circulating stirrer. The efficiency of the stirring

[1] Reprinted from *Jour. of the Soc. of Chemical Industry*, September, 1918.

is very important, as upon it depends the time necessary to complete the sulphonation. This reaction was carried out in a flask fitted with a reflux condenser, and only a small loss of toluene vapour took place, sulphonation being complete in about thirty minutes with very little charring. Under these conditions about 75 per cent. of the toluene is converted into the *p*-sulphonic acid, the remainder being a mixture of *o*- and *m*-acids. If this mixture of acids was isolated, converted into dry sodium salts, and treated with phosphorous pentachloride, the *p*-chloride could be obtained; but as the other chlorides would be useless there would be a considerable waste of material. We therefore made use of Lange's discovery (Ger. Pat. 57, 391) that if water is added so that the mother liquid consists of only 66 per cent. sulphuric acid, then on cooling, the crystals that separate consist only of the *para*-acid which separates almost completely—the mother liquid retaining the *o*- and *m*-isomers in solution. In order to carry this out, 45 Cc. of water is added to the reaction mixture after sulphonation as above and the liquid poured out and cooled. The liquid rapidly crystallises and sets to a crystalline cake, and on filtering over an asbestos mat (as in a Gooch crucible) nearly the whole of the mother liquid can be drained away, leaving a white crystalline mass which proves to contain only small amounts of *o*- and *m*-impurities. The crystals that separate appear to be the monohydrate, $C_7H_7SO_3H$, H_2O, and correspond to about 75 per cent. of the toluene taken. Hence about 25 per cent. of the toluene is either lost as vapour or is contained in the mother liquor in the form of the *o*- and *m*-acids. The separation by crystallisation is, however, not very sharp, and the mother liquid on standing continually deposits further crops, which, however, are nearly free from the *para*-acid.

The *o*- and *m*-acids being useless to us, experiments were made by Mr. C. L. Carter at my suggestion, to see how completely the toluene could be recovered by the action of superheated steam. It was found that if the liquor were heated to about 170° and then a brisk current of steam at 200° were blown through it the bulk of the toluene was rapidly evolved, the distillate containing at first as much as 20 per cent. toluene. When the percentage fell below 5 per cent. the operation was stopped, as further continuance was hardly profitable (Armstrong, *J. Chem. Soc.*, 1884, 45, 148). The total amount thus recovered was about 14 per cent., leaving 11 per cent.

not accounted for. Part of this is lost by evaporation during mixing and subsequent sulphonation, and a small part is left in the sulphuric acid. Probably most of the remainder is lost by evaporation *in vacuo* during the filtration of the crude acid.

The cake of crude *p*-acid is dissolved in water, slightly more than enough calcium carbonate is added to precipitate the sulphuric acid as calclum sulphate, and the still acid liquid is filtrated. It is then nearly neutralized with caustic soda, made distinctly alkaline with sodium carbonate, boiled, and again filtered. It is important to remove the calcium as completely as possible, as it may become a troublesome impurity in the later stages. This method gives a solution containing only sodium sulphonate and sodium carbonate, and on acidifying with hydrochloric acid and evaporating to dryness there remains a pure white salt consisting of the required sodium sulphonate with a trace of sodium chloride. The sulphonate is so soluble in water that this seems to be the best method of preparation.

Preparation of the Sulphonic Chloride.—This can easily be prepared by heating together on the water bath approximately equal weights of sodium salt (dried at 140° C.) (191 Gm.) and phosphorus pentachloride (208.5 Gm.). In this case the reaction takes place very rapidly and easily and a large amount of phosphorous oxychloride is obtained. Mr. C. S. Hicks, working in my laboratory, found, however, that the oxychloride itself can be used according to the equation, $2XSO_3Na + POCl_3 = 2XSO_2Cl + NaPO_3 + NaCl$, and he obtained a 76 per cent. yield. Hence if less than half the weight of pentachloride be taken and the mixture be heated some hours on the water-bath under reflux condenser the following reaction takes place: $3XSO_3Na + PCl_5 = 3XSO_2Cl + 2NaCl + NaPO_3$. The proportions of salt and pentachloride according to this equation are 573 to 208.5, or 2–3/4 to 1; but the reaction is very slow towards the end as the mass becomes too solid and the yield is apt to decrease. This trouble might be avoided by using the theoretical proportion of pentachloride and sufficient oxychloride, which should then be recovered unchanged. An experimental trial of this gave 92 per cent. yield but the oxychloride was not recoverable. We therefore use 2 parts of sodium salt for each part of pentachloride and the action then completes itself more easily and only small amounts of oxychloride are left over—the reaction being allowed to go on over night under reflux condenser on a water-bath. The oxychloride is then distilled off *in vacuo* and the residue put into cold water. The sulphonic chloride is the only part insoluble and is separated by filtration: a small amount of oily impurity (*o*- and *m*-sulphonic chlorides) can be pressed out from the solid cake. The yield is nearly quantitative, 96–99 per cent. The solid sulphonic chloride still contains small amounts of *o*- and *m*-impurities, but these are gradually eliminated in the later stages.

Preparation of Sulphonamide.—This operation, though quite simple in theory, causes a certain amount of trouble without special apparatus. The alternative methods are treatment with ammonium carbonate on the water-bath and treatment with strong ammonia solution. The latter method, if properly controlled, is decidedly the more satisfactory. If the sulphonic chloride is ground to a fine powder and concentrated ammonia is poured upon it, a violent reaction begins almost at once and the liquid boils. In this way considerable amounts of ammonia are driven off and the action is apt to be incomplete. We had some difficulty in procuring vessels in which the reaction could be conveniently carried out under pressure, and owing to the impossibility of getting special vessels made which would stand the action of a hot mixture of ammonia and ammonium chloride, we used stoneware ginger-beer bottles which had a screw stopper with a rubber seating. 100 Gm. of sulphonic chloride could be placed in each, 100 Cc. of 0.880 ammonia quickly added and the stopper screwed in firmly. On shaking vigorously the action began, and as soon as the bottle became too hot to hold it was placed in cold water. No mishaps occurred and the yield was excellent, the liquid only requiring filtering and the residue washing with cold water. The mother liquors on evaporation give small amounts of the *m*-amide but very little else besides the ammonium chloride. Under these conditions about half the ammonia taken is actually used and on a large scale the unchanged ammonia could be recovered by boiling the liquors. The yield of *para*-sulphonamide is 94–97 per cent.

Preparation of Chloramine-T.—The conditions for the conversion of amide to chloramine were given in detail by Dakin, one mol. of amide being dissolved in 1.2 mols. of sodium hypochlorite of definite concentration and the chloramine then precipitated by the addition of strong brine. At first his actual proportions were used, but it was found to be unnecessary to use brine. If the amide is dissolved in a warm, strongly alkaline solution of sodium hypochlorite of concentration 1.3 to 2.0 N, a large crop of chloramine is formed on cooling and the remainder can easily be obtained on evaporation. It is very important to have a decided excess of caustic soda, and for each mol. of amide we usually take 1.05 to 1.1 mols. of hypochlorite and 1 mol. of sodium hydroxide. The preparation of the hypochlorite is of course straightforward. Owing, however, to the cost of acids in New Zealand and to there being no electrolytic source of chlorine, we found it most convenient and cheapest to use bleaching powder as the starting point. The crude chloramine-T obtained in this way is contaminated with sodium chloride; but even the crude crystals on drying contain 92–95 per cent. of chloramine. The substance can be easily purified by recrystallization from water. If dissolved in twice its weight of hot water, a large proportion can be obtained in the pure form (over 98 per cent.) on cooling. The final filtration is apt to be troublesome; the crystals do not pack well on the filter and it is therefore difficult to remove the mother liquid completely. If, however, the cooling is carried out rapidly without stirring a different shape of crystal is obtained which filters much more readily. It is thus possible, working with large quantities, to get a product of over 99 per cent. purity.

Utilization of By-products.—In the sulphonation as described most of the toluene is used, but half the sulphuric acid taken is contained in the mother liquors after removal of the toluene by superheated steam. At first it was hoped that it would be possible to recover the acid in the pure state by distillation and use it over again; but there is always some charring and the impurities remaining make it comparatively useless. It contains 34 per cent. of water. In the remaining stages of preparing the sulphonate the by-products are small in quantity and comparatively valueless. Some lime or calcium carbonate is used and converted into sulphate, but the quantity is very small. In the preparation of the sulphonic chloride the by-products are sodium chloride and sodium *ortho-* and *meta*-phosphate. It would probably be worth while to utilize the latter on the large scale but out experiments are incomplete. In the preparation of the sulphonamide the chief by-products are ammonium chloride and excess of ammonia. The former can be easily recovered and the ammonia could be made use of with suitable apparatus.

In the preparation of hypochlorite and of chloramine, the by-products are calcium carbonate—a nearly pure precipitate—and a liquor consisting of sodium chloride and hydroxide. No doubt use could be made of this liquor but we have made no attempt in this direction. The above results have been obtained under laboratory conditions making some pounds of chloramine per week. Owing to lack of filtering apparatus and other labor-saving devices we have not made experiments on a still larger scale; but our experiments have always been made with a view to their application to large-scale operations and we have every reason to believe that they would not fail in commercial practice.

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EMETINE: NEW PREPARATIONS.[1]

At a meeting of the Chemical Society early in the year, F. L. Pyman described a stereoisomeride of emetine known as *Iso-emetine.* Physiological tests by H. H. Dale showed that this substance has about half the toxicity of emetine when given to rabbits intravenously. Clinical reports by G. C. Low, however, show that although it is well tolerated by man it does not appear to have any curative effect in amoebic dysentery.

An "emetine adsorption product," devised by Dale, but the exact composition of which is not stated, is reported on by R. Donaldson *et al.*,[2] who give it an extensive trial side by side with emetine bismuth iodide. Their results show that these two substances are of equal potency as regards rendering the stools negative, and that both are superior to emetine administered subcutaneously. Emetine bismuth iodide is handicapped by its disturbing effect on the stomach, and is inferior to the emetine adsorption product, which is well tolerated. The cases examined appear to show that not more than 50 to 60 per cent. may be regarded as possible cures after one course of twelve doses, therefore the minimum course of twelve doses should be increased, and the emetine adsorption product should be used instead of any other preparation. Of nine cases treated only one had vomiting, in two cases there was slight enfeeblement of the heart's action, and in four there was looseness of the bowels.

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[1] Reprinted from *The Prescriber,* October, 1918.

[2] *Practitioner,* 1918, 101, I; July.

THE NEWLY ELECTED OFFICERS OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

The tellers have announced the results of the election for officers of the Association that has been held by mail. Those elected to preside over the destiny of the Association during the association year 1919–1920 are: President, Prof. L. E. Sayre; First Vice-President, Prof. Theodore J. Bradley; Second Vice-President, Harry Whitehouse; Third Vice-President, Prof. E. Fullerton Cook; Members of the Council for three years, Dr. James H. Beal, Prof. Charles H. La Wall, Samuel L. Hilton.

CURRENT LITERATURE.

SCIENTIFIC AND TECHNICAL ABSTRACTS.

Adulterant of Stramonium Leaves.—A large consignment of stramonium leaves recently sent from Spain and France was found on examination to consist almost entirely of the leaves of *Xanthium macrocarpum* DC., a plant widely distributed, especially in the Mediterranean region. Although the spiny fruiting capitulum somewhat resembles the fruit of stramonium, the leaves are easily distinguished by their smaller size, yellowish-green color, and harsh hairs occurring on the lamina. Under the microscope three forms of hairs are to be seen, two protective and one glandular. Of the protective hairs one form is short and lignified, the other longer; the glandular hairs are characterized by the rosettes of calcium oxalate in some of the cells. Rosettes of calcium oxalate are also to be found in the mesophyle, but they are much smaller and less numerous than those of stramonium. A transverse section of the midrib exhibits six bundles, whereas in stramonium the bundle is undivided. The leaves of *X. Strumarium* L., have also been found in stramonium leaves. (*Pharm. Journ.*, 1901, p. 326.)—(P. Guerin, *L'Union Pharm.* Through the *Pharmaceutical Journal* and *Pharmacist.*)

Storax Assay.—Van Itallie and Lemkes suggest the following method for determining the cinnamic acid in storax: Boil 1 Gm. with 20 Cc. of *N/2* alcoholic solution of potash for one hour under a reflux condenser, evaporate to dryness and redissolve in 25 Cc. of water. Shake this solution out with ether, wash the ether with water and return the washings; dilute to about 950 Cc., add 10 Cc. of dilute sulphuric acid, and make the volume up to 1,000 Cc. Mix 100 Cc. of this with 10 Cc. of $N/10$ potassium bromate solution, 1 Gm. of potassium bromide, and 5 Cc. of sulphuric acid. After 15 minutes add 1 Gm. of potassium iodide, stand for 5 minutes, and titrate with $N/10$ sodium thiosulphate. Not more than 6.5 Cc. should be required. 1 Cc. $N/10$ potassium bromate solution corresponds to 0.00/4 Gm. of cinnamic acid. (*Schweiz. Apothcker Ztg.*, 1918, p. 286. Through the *Pharmaceutical Journal* and *Pharmacist.*)

CLASSIFICATION OF BACTERIA AS TO DIASTASE PRODUCTION.—During the last two years in the Dairy Bacteriology Laboratory of the University of Illinois the use of potato slants for the determination of diastase production by bacteria has been replaced by a simple plate method as follows: A starch agar is made by adding 0.2 per cent. of water-soluble starch to the regular plain agar. This starch agar can be sterilized in the autoclave along with other mediums. Some hydrolysis takes place, but not enough to interfere with the test. The agar is poured into Petri dishes and allowed to cool, when a stroke 2 inches long is made with a loopful of an agar slant growth of the organism to be tested. The plates are incubated for two days at 37° C. and five days at 20° C., after which they are flooded with a saturated solution of iodine in 50 per cent. alcohol. A clear area about the stroke averaging more than 2 mm. in width classifies the diastatic action as strong, while a width of 2 mm. or less marks it as feeble and the absence of a halo as absent. (P. W. Allen, Urbana, Ill. *Journal of Bacteriology,* Baltimore. Reprinted from *The Journal of the American Medical Association.*)

URINE STAINING TECHNIC.—Minerbi heats the isolated urine sediment with human blood serum or egg albumin, both of which coagulate under the action of fixation measures. Then when the May-Grunwald-Giemsa stain is applied, the background is homogeneous and colorless, and the preparation is exceptionally instructive in every respect. After centrifugating the urine, all the fluid is decanted except one or two drops. Then a droplet of egg albumin is taken up on a platinum loop and the loop is plunged into the sediment and agitated to mix it, with care not to cause production of bubbles. Then the mouth of the tube is held slanting on an object glass and with the platinum loop a droplet is spread all over the object glass, and two other slides are prepared in the same way. Before drawing out the sediment, the loop is singed to be sure that no undissolved albumin is sticking to it. He regards the method as extremely practical and instructive. His first publication on the advantages of impregnation of the sediment with human serum date from 1914. (C. Minerbe. *Rivista Critica di Clinica Medica,* Florence, through *The Journal of the American Medical Association.*)

EUPATORIUM GLUTINOSUM LAM. SUBSTITUTED FOR MATICO N. F.—Examination of importations of "matico leaves" (*Piper angustifolium* Ruiz et Pavon) has disclosed that in one instance the leaves of *Eupatorium glutinosum* Lam. have been substituted for the true material. *Piper angustifolium* has alternate leaves, which have a finely crenulate margin, unequal subcordate base, a finely bullate upper surface, and prominent venation below, and have no glandular hairs; whereas *Eupatorium glutinosum* has opposite leaves, which have a serrate margin, cordate base, coarsely bullate upper surface, and numerous glandular hairs. The flowers, which occur occasionally in samples of the leaves, consist of a spike in the case of matico and of a cymose paniculate composite head in the case of *Eupatorium glutinosum.* The department will recommend the detention of shipments of "matico leaves" found to consist in whole or in part of the leaves of *Eupatorium glutinosum.—Service and Regulatory Announcements U. S. Department of Agriculture, No. 23.*

GREEK SAGE AND SPANISH SAGE SUBSTITUTED FOR SAGE (SALVIA OFFICINALIS).—Examination by the bureau of commercial samples of "sage" has disclosed that in some instances the samples were not obtained from *Salvia officinalis* L., but consisted of the leaves of Greek sage, *Salvia triloba* L., and Spanish sage, *Salvia lavandulæfolia* Vahl. These forms, while very closely related to true sage, have certain differences in appearance and flavor, and are well recognized by the trade as distinct forms. Greek sage may be distinguished from true sage by the usually broader, shorter, thicker, entire leaves, short petioles, and by their more wooly appearance. Spanish sage may be distinguished by its smoother, considerably smaller, entire leaves and relatively long petioles. Neither Greek sage nor Spanish sage possesses the crenulate edge and the strong venation characteristic of true sage. The department is of the opinion that the term "sage," without any qualifications, applies only to material obtained from *Salvia officinalis,* and should not be used for material obtained from other related species nor for mixtures of other species with it. Material obtained from *Salvia triloba* should be labeled "Greek sage"; material from *Salvia lavandulæfolia* should be labeled "Spanish sage." Mixtures of these forms should be sold only under an appropriate label.—*Service and Regulatory Announcements U. S. Department of Agriculture, No. 23.*

MACROTOMIA CEPHALOTES D. C. SUBSTITUTED FOR ALKANET ROOT (ALKANNA TINCTORIA TAUSCH.).—Examination of samples of "alkanet root" (*Alkanna tinctoria* Tausch.) has disclosed that in one instance the root of *Macrotomia cephalotes* D. C. has been substituted for the true material. *Macrotomia cephalotes* is very much larger than the genuine alkanet; it occurs in pieces from 20 to 40 centimeters long and from 2 to 5 centimeters thick, whereas alkanet is about 1 to 1.5 centimeters in diameter and is usually 10 to 15 centimeters in length. It is black-violet in color and somewhat metallic in appearance, whereas alkanet is of a dull maroon color. It has a distinctly spiral twist, resembling a twist of tobacco, whereas alkanet is only slightly twisted. Preliminary experiments made in this bureau indicate that it contains considerable amounts of a coloring principle resembling that of alkanet. The department will raise no objection to its importation if properly invoiced, labeled, and sold.—*Service and Regulatory Announcements U. S. Department of Agriculture, No. 23.*

BOMBAY OR INDIAN CORIANDER.—Examination of importations of "coriander seed" (*Coriandrum sativum* L.) has disclosed that in some instances they have consisted of fruits differing in physical appearance from the Pharmacopœial description. The fruits are oval instead of spherical and not infrequently yield less volatile oil than the Pharmacopœial article. The product appears in the trade as "Bombay" or "Indian" coriander and appears to have value. The department will not object to the importation of Bombay or Indian coriander if invoiced, labeled, and sold as such, provided that any deficiency in volatile oil be indicated.—*Service and Regulatory Announcements U. S. Department of Agriculture, No. 23.*

Piptostegia Pisonis Mart. Substituted for Jalap U. S. P.—Examinations of importations of "jalap root" (*Exogonium purga* (Wenderoth) Benth.) have disclosed that in some instances the root of *Piptostegia pisonis* Mart. has been substituted for the true material. It occurs in commerce in the form of transverse circular or oval sections, varying from about 3 to 8 centimeters in diameter and from about 0.3 to 0.8 centimeter in thickness, whereas jalap generally occurs in fusiform irregularly ovoid or pyriform tuberous roots, the upper end more or less rounded, the lower end slightly tapering, the roots varying from 4 to 15 centimeters in length and from 12 to 60 millimeters in diameter. The pieces of *Piptostegia pisonis* are marked with several concentric rings, aside from the pale grayish-brown tint and the presence of numerous dots of translucent pale resin on the surface, bear considerable resemblance to white bryony root. Preliminary experiments with resin isolated from the root in this bureau indicate that the material has purgative properties. The department will raise no objection to the importation of *Piptostegia pisonis,* provided it is properly invoiced, labeled, and sold. In releasing such goods, however, the department will take such precautions or impose such conditions as seem necessary to prevent its sale as jalap U. S. P.—*Service and Regulatory Announcements U. S. Department of Agriculture, No. 23.*

Strophanthus Sarmentosus Substituted for Strophanthus Seed (Strophanthus hispidus).—Examination of importations of "Strophanthus seed" (*Strophanthus hispidus* P.DC.) has disclosed that in some instances the seeds of *Strophanthus sarmentosus* P.DC. have been substituted partially or wholly for the true material. The embryo of *Strophanthus hispidus* contains no crystals of calcium oxalate and gives a green color when treated with 80 per cent. sulphuric acid, whereas the embryo of *Strophanthus sarmentosus* has abundant crystals of calcium oxalate, and gives a red color when treated with 80 per cent. sulphuric acid. The department will recommend the detention of any shipment of *Strophanthus hispidus* found to consist in whole or in part of the seeds of *Strophanthus sarmentosus.* There is little reliable data available regarding the physiological activity of this species.—*Service and Regulatory Announcement U. S. Department of Agriculture, No. 23.*

Aconitum Chasmanthum Stapf. Substituted for Aconite U. S. P.—Examination of importations of "aconite" has disclosed that in one instance the root of *Aconitum chasmanthum* Stapf. has been substituted for the true material. The root of *Aconitum chasmanthum* is generally smaller than that of *Aconitum napellus,* about 2 centimeters long and about 0.75 centimeter in diameter; it is less wrinkled and the rootlet stubs are usually clustered at the basal end. Its fracture is lighter in color and its texture less tough and resinous. The department will recommend the detention of any shipment of aconite root found to consist in whole or in part of the roots of *Aconitum chasmanthum.* In releasing such goods, the department will take such precautions or impose such conditions as seem necessary to prevent their sale as aconite U. S. P.—*Service and Regulatory Announcement U. S. Department of Agriculture, No. 23.*

MEDICAL, PHARMACEUTICAL AND DISPENSING NOTES.

Cutaneous Irritation by Mustard Oil as Influenced by Various Solvents.—Sollman says that olive oil and other good solvents for mustard oil hinder its penetration into the skin. The greatest irritation is obtained by watery suspensions, for instance, in mucilage. Olive oil and turpentine produce practically no hyperemia; ether and absolute alcohol produce very little hyperemia; 95 per cent. alcohol causes a distinct hyperemia, whereas 50 per cent. alcohol causes marked and lasting hyperemia; mucilage of acacia and simple syrup cause the most intense and persistent hyperemia. (T. Sollman, *Journal of Pharmacology and Experimental Therapeutics,* through the *Journal of the American Medical Association.*)

Pharmacologic Study of Benzyl Alcohol.—Experimental data and clinical cases show that benzyl alcohol is an efficient local anesthetic when administered in aqueous solution. This alcohol is soluble up to 4 per cent. in water or in physiologic saline solution. These concentrations appear to be entirely efficient for practical purposes. The interesting features in connection with this drug which should be especially emphasized are in the first place its low toxicity as compared with that of the commonly employed local anesthetic alkaloids of which cocaine is the standard representative. The next interesting and important feature in connection with benzyl alcohol as an anesthetic is the ability of the organism to metabolize it and excrete it in an innocuous form. Third, an important feature of this local anesthetic is its high boiling point and the consequent ease of sterilization. Last, the comparatively low price of the drug and its ease of production. (D. I. Macht, *Journal of Pharmacology and Experimental Therapeutics*, April, 1918, through the *Journal of the American Medical Association.*)

ACRIFLAVINE AND PROFLAVINE.—An investigation was undertaken by Carslaw and Templeton with the object of ascertaining whether the action of proflavine differed in any way from that of acriflavine. Since October, 1917, a large proportion of the infected gunshot wounds admitted to one hospital have been treated with acriflavine, and the clinical results have been observed in over sixty cases. Proflavine followed by eusol was used in thirty cases (thirty-two wounds being treated). In all cases 1 : 2,000 solution in normal saline was used. The rapid improvement in the general condition of patients as shown by subsidence of temperature, pulse rate, etc., and rapid disappearance of pain and of inflammatory edema in the vicinity of wounds were very evident. Although the action of acriflavine and proflavine is very similar there can be no doubt that proflavine is slower. The improvement in the general condition of patients is not so rapid. The formation of the fibrinous membrane is not usually complete until the fifth, sixth, or seventh day in contrast with its presence on the third, fourth, or fifth day when acriflavine is used. Further, separation of membrane and attainment of a "clean" wound are also slightly delayed. The application of flavine to affected wounds does not render them bacteriologically sterile. Flavine is clearly antiseptic, not disinfectant in action. There is a complete absence of evidence of damage to tissues when these salts are used in solution not stronger than 1 : 1,000. There is no necrosis of any of the exposed tissues. These salts are of undoubted value in controlling and preventing the spread of sepsis, as is shown by the rapid improvement in local and general conditions. This object having been gained, there is no advantage in continuing their use, as a condition is used in which reparative changes are slow, although not by any means absent. Following on the substitution, after a few days, of a more stimulating antiseptic, for instance, eusol, a "clean" wound is obtained sooner than by any other form of treatment known to the authors. There is no evidence of any general toxic effect. (*The Lancet,* through the *Journal of the American Medical Association.*)

BRILLIANT GREEN AND GUNSHOT WOUNDS.—Of a large number of cases treated with brilliant green information regarding their subsequent progress was obtained in only forty-six cases. The wounds had, without exception, been received from two to eight hours previous to treatment, and were all severe, with considerable tissue damage. No special type of case was selected, but it was not used in cases involving the peritoneal or pleural cavities, though there seems to be no reason why it should not be used. The solutions used were: (1) 1 : 1,000 brilliant green in normal saline; (2) 1 : 500 in normal saline; (3) 1 : 500 in 0.5 per cent. chloretone. Of the solutions No. 3 was preferred. It appeared to have a definitely analgesic effect, rendering dressing less painful. Wounds appear to clean more quickly under the stronger solutions. No toxic symptoms were observed in any case. Results were recorded by independent observers and reported, for the most part, by means of Form M. R. C. 1, since it was necessary to evacuate early. When possible a complete excision of damaged tissue was carried out and foreign bodies were removed. In cases of compound fracture all fragments of bone having no periosteal attachment were removed. Damaged tissue is more deeply stained by brilliant green than is healthy tissue. It is useful in this respect when excising the tracks of missiles. All tissue, except skin, which holds the stain of 1 : 500 solution, should be excised. Brilliant green produces exuberant, but very vascular, bright red granulation. Noticeable features in cases treated with it are the absence of edema and the inflammation round the wound and the rapidity with which sloughs and sequestra separate. It is painless in application and does not appear to interfere with the growth of epithelium. For these reasons it may be considered a useful antiseptic, and though it can by no means atone for an incomplete or faulty primary excision it may be used with advantage where anatonic conditions render complete primary excision impossible. (*The Lancet,* through the *Journal of the American Medical Association.*)

HYPOCHLORITE AND CHLORAMIN-T SOLUTION.—Exact determinations of the rapidity of the fall in chlorine concentration on pathologic and on normal skin under experimental conditions, were made by Austin and Taylor because they might be of value to surgeons using Dakin's hypochlorite and chloramin-T solutions clinically. The left ears of three white rabbits of the same relative size and weight were exposed to the rays emitted by a Coolidge tube. The spark gap used measured three inches; the miliamperage was 110; the distance from the target to the ear was six inches; and the time of exposure was twenty minutes. Eight weeks later the roentgen rayed ears each exhibited a sharply demarcated gangrenous area over which there was considerable crusting of epithelium and secretions and in the lumen there was much thick pus. The ears of the affected rabbits were each suspended for twenty minutes in a beaker containing 400 Cc. of the solution to be tested.

The fall in chlorine concentration of Dakin's hypochlorite solution was more rapid in contact with necrotic than in contact with normal tissue. The fall in chlorine concentration of chloramin-T solution was very slight when applied to necrotic tissue and is negligible when applied to normal tissue. The action of the hypochlorite solution on tissue resulted in the separation of particles of necrotic tissue, hair, epithelial scales, coagulated serum, etc., and a gradual digestion of these substances, taking place over a period of at least seventeen hours. The fall in the chlorine concentration of hypochlorite solution was not complete until the particles were completely dissolved. Chloramin-T solution, 2 per cent., had no erosive effect comparable with that exhibited by the hypochlorite solution. Repeated exposure to the three solutions showed that the hypochlorite solution was superior in its cleansing ability on necrotic tissue. The hypochlorite solution was much more irritating to normal rabbit skin than chloramin-T solution or the alkaline control solution. Therefore, the authors conclude that irritating effects must be due to the readily available chlorine. (From the *Journal of Experimental Medicine,* through the *Journal of the American Medical Association.*)

TOXICITY OF CERTAIN ANTISEPTICS.—The toxic action of a number of antiseptic substances in common use was investigated by Taylor and Austin. The method was to inject increasing doses into mice intraperitoneally and into guinea-pigs both subcutaneously and intraperitoneally. The only antiseptic of which the smallest fatal dose was smaller than the largest survival dose was dichloramin-T. Since two mice survived 4.7 Mg. per 100 Gm. of body weight, it is probable that 15.5 Mg. rather than 1.6 Mg. is to be considered the smallest fatal dose for this series. Of all the substances tested, eucalyptol and brilliant green were the most toxic, the lethal dose of each being 0.1 Mg. per 100 Mg. of body weight. Mercurophen, mercuric chlorid, and chloramin-T constitute the group with the next highest toxicity, the lethal dose being 1 Mg. per 100 Gm. of body weight. Dichloramin-T, proflavine and the four hypochlorite solutions tested follow in the order named with a lethal dose of about 10 to 15 Mg. per 100 Gm. of body weight. The least toxic chemicals are iodine and phenol, of which the lethal doses are about 5c Mg. per 100 Gm. of body weight. The lethal dose of Dakin's hypochlorite solution injected under the skin of the adbomen of guinea-pigs per 100 Gm. of body weight is the same as that determined intraperitoneally in the mouse. Chloramin-T and dichloramin-T administered in this manner gave rise to local necrosis with extensive sloughing. Therefore, the substances injected intraperitoneally into mice and guinea-pigs arranged in the order of their decreasing toxicity are: eucalyptol and brilliant green; dichloramin-T and proflavine; hypochlorite, Dakin's hypochlorite, Javelle water, and magnesium hypochlorite, iodine, and phenol. Now that Dakin's bland solvent, chlorcosane, is available as a vehicle for dichloramin-T, the authors advise that eucalyptol should be discarded for this purpose because of its much greater toxicity. (From the *Journal of Experimental Medicine,* through the *Journal of the American Medical Association.*)

Report on Carrel-Dakin Solution.—Contrary to many observers the authors believe that the Carrel technic is not a complicated one. It requires no more time, labor or material than the method of treating purulent collections with drainage tubes and irrigations of saline, mercuric bichloride or phenol solutions. The deodorizing effect of this solution is very important. This has a psychologic effect in aiding the patients' convalescence. The irritating effect of the solution on skin surfaces has been very slight. The authors have abandoned the use of gauze strips saturated with petrolatum and use no protection at all, except when the skin appears hypersensitive, in which case a spray of liquid paraffin is used. The mucous surfaces appear to suffer no more than the skin, as instanced by the use of the solution as a vaginal douche.

Emphasis is laid on the contraindication to the use of the solution in cases in which there is much hemorrhage. This is controlled as well as possible at time of operation and the solution not used until twenty-four to forty-eight hours have elapsed. Other contraindications to the use of the solution are in infections due to the *Bacillus pyocyaneus,* on which it seems to have no effect, and in all classes of wounds after the infection has been controlled, when it is unnecessary and has a retarding influence on granulations. In fecal fistulas the solution is not used, because it has been noticed that patients with this condition suffer with a great deal of discomfort, and at times pain, for three to four hours after the dressing.—(Drs. J. B. Deaver, Lankenau Hospital, Philadelphia, J. W. Bodley, W. H. Means and H. E. Knox, Philadelphia. From the *Medical Record,* New York, through the *Journal of the American Medical Association.*)

RINGWORM OF THE SCALP.—Douglas Freshwater gives several useful prescriptions for ringworm of the scalp. In small families, to prevent the other children becoming infected, it is a safe plan to dress the hair daily with the following brilliantine:

℞	Acid salicylic	gr. x
	Ol. lavand.	♏ v
	Ol. bergam.	♏ v
	Ol. olivæ	ad ℥ i

A useful antiseptic shampoo wash is:

℞	Thymol	gr. xv
	Sap. mollis	℥ i
	Sp. vin. rect.	℥ i

This is allowed to remain some 10 or 15 minutes on the scalp before being rinsed off.

Oleate of copper is useful before and during the period of epilation:

℞	Cupri oleatis	ʒ i
	Hydrarg. oleatis	gr. xxv
	Adipis lanæ hydros.	℥ i
	Ol. olivæ	℥ i

William's picric acid lotion is as follows:

℞	Camphor	℥ iv
	Sp. vin. rect.	℥ vi
	Acid picric	gr. viii

Solve. Sig.—"Inflammable. To be painted over the scalp twice daily." Generally the ringworm hairs are loosened, and come away with their bulbous portions in from ten to thirty days. A yellow staining of the hair may be noticeable some weeks after treatment. From *The Prescriber,* September, 1918.

TRADE INTEREST.

To Manufacture Coconut and Palm Oil in Colon.—An American company with a capital of $50,000 is constructing at Colon a two-story concrete building for manufacturing coconut and palm oils, soap, and their by-products, glycerin, caustic potash, carbonate of potash, soda, etc. It will be possible to make 1,500 gallons of coconut oil and 250 gallons of palm oil daily. The factory will also have a daily capacity to manufacture 500 boxes (60 pounds each) of laundry and toilet soaps. The company has two schooners for trading along the coast and bringing coconuts to the factory; and as coconuts were exported from Colon in 1917 to the number of 19,528,843, an ample supply of these nuts can be obtained for the factory the year round. Palm oil will be extracted from the nuts of the Guinea, Coroza Grande, and other palm trees growing in various parts of the Republic of Panama, as well as in the Canal Zone. It is proposed to make other vegetable oils, but in limited quantities. As the manager of this oil factory has had much experience in such work, and as the supply of raw material is ample and the demand for vegetable oils large, the new company should be quite successful in its operations in Colon. (The address of the company can be obtained from the Bureau of Foreign and Domestic Commerce or its district or coöperative offices by referring to file No. 104,987.) (Consul Julius D. Dreher, Colon, from *"Commerce Reports,"* August 22, 1918.)

Control of Camphor Production in Taiwan.—Seven officials and experts are being appointed by the Monopoly Bureau in the Japanese Government General of Taiwan (Formosa). They will undertake the control of camphor production and will conduct investigations into the camphor market. This step has been taken to prevent the decay of the camphor industry in Taiwan in view of the probable decrease in production this year of about 1,000,000 pounds. (From *Weekly Bulletin,* Canadian Department of Trade and Commerce, Ottawa, August 5, through *Commerce Reports,* August 22, 1918.)

BOOK REVIEWS.

A TEXT-BOOK OF CHEMISTRY INTENDED FOR THE USE OF PHARMACEUTICAL AND MEDICAL STUDENTS. By SAMUEL P. SADTLER, Ph.D., LL.D., VIRGIL COBLENTZ, Ph.D., F.C.S., and JEANNOT HOSTMAN, Ph.G. Fifth Edition, Revised and Rewritten. Philadelphia and London, J. B. Lippincott Company.

We are pleased to note the appearance of the fifth edition of this approved text-book of chemistry for the use of pharmacy and medical students. Throughout this revision bears testimony to the thoughtfulness and care that has been exercised by the authors in the selection from the broad field of general chemistry of those subjects that relate especially to materia medica and the duties of the closely allied professions of medicine and pharmacy in the discharge of their service to their fellowmen. The changes effected by the Ninth Decennial Revision of the Pharmacopœia and likewise the newer remedies have been incorporated in the revised text.

The experience of the authors as teachers is evidenced by the concise, yet clear, methods adopted for the presentation of the numerous rather intricate subjects necessarily included in a text-book of this character and purpose. The scope of the work, while limited to the needs of students of the professions it is intended to serve, nevertheless, presents the subjects of general chemistry and the physics related thereto, sufficiently in detail to serve as the foundation for future higher study in special fields of analytical and research work.

The typography, printing and binding are excellent and the illustrations, while not profuse, are sufficient and very well demonstrate the theories, facts and methods shown.

The contents of the book are presented in four divisions of the subject matter, Part I being devoted to the consideration of Elementary Physics, Part II to Chemistry of the Non-Mentals, Part III to Chemistry of the Metals and Part IV to Organic Chemistry.

It is noted that the classification of the elements and the periodic system is treated in Chapter VIII of Part II after six preceding chapters of this part have discussed the history, physical and chemical properties and uses of the non-metal elements. A more logical place for the presentation of this subject would appear to be in association with the "theoretical introduction" given in Chapter I. Likewise the treatment of "Electrolysis and Its Application" as Chapter XII of Part IV, Organic Chemistry, would appear as somewhat incongruous. These minor criticisms, however, do not detract from the accuracy of the information given and the value of the work as a most acceptable handbook alike for the average physician and pharmacist as for the students who are preparing for life work in these callings.

G. M. B.

American Drug Manufacturers Association Proceedings for Nineteen Hundred and Eighteen.

It has been quite a treat to peruse this volume of 343 pages detailing the proceedings of the "Seventh Annual Meeting of the American Drug Manufacturers Association, held at the Waldorf-Astoria Hotel, New York City, January 28–30, 1918. The addresses, papers, reports and discussions bear throughout the evidence of a very live association whose members are familiar with the national, trade and scientific problems associated with the manufacture of medicinal preparations and are energetically meeting these with the ability of well-equipped modern business men.

The reports of the various committees deal not only with the internal affairs that are the special problems of this association, but, likewise, consider many questions that are of general import to all manufacturers and merchants. Not the least important is the report of the Committee on Standards and Deteriorations. It is apparent that the membership of the association of drug manufacturers will give to this committee of the organization exceptional facilities for a most valuable piece of constructive work in the determining of proper standards for drugs and the rates of deterioration of medicines of a non-permanent character. Their coöperation with the various committees of revision of the legal standards and the governmental departments and other scientific and technical organizations which are likewise interested in these problems, will doubtless prove of great value.

The secretarial and editorial work of the book is fully in keeping with the high class of its contents. What is equally evident throughout the "Proceedings" is the prospects for the continuation of the many good works that have been so auspiciously inaugurated. We extend our hearty congratulations and shall anticipate the pleasure of noting many more yearly proceedings indicative of the same spirit and progress shown in the present volume.

G. M. B.

A CRITICAL REVISION OF THE GENUS EUCALYPTUS. By J. H. MAIDEN, I.S.O., F.R.S., F.L.S., Government Botanist of New South Wales and Director of the Botanic Gardens, Sydney. Vol. IV, Part 5.

It has been our privilege to note from time to time in these pages, the appearance of the parts of this elaborate monographic study of the Eucalypti. The Part XXXV of the complete work, that is now in hand, deals in the approved style adopted for this monograph with the following species: *Eucalpytus Lehmanni* Preiss., *E. annulata* Benth., *E. platypus* Hooker., *E. spathulata* Hooker., *E. gamophylla* F. v. M., *E. argillacea* W. V. Fitzgerald.

The four lithographic plates illustrating the text of this part are of the same excellent quality as has been shown throughout the monograph.

G. M. B.

OBITUARY.

JOHN C. GALLAGHER.

When John C. Gallagher died in Jersey City on October 2, 1918, the retail drug trade lost one of its most enthusiastic and efficient workers.

The deceased was born in Brooklyn, November 4, 1861. After attending the public schools and St. John's College in Brooklyn he entered the employ of T. C. Prevost. He was a member of the class of 1882 in the College of Pharmacy of the City of New York.

In 1882 he came to Jersey City as junior clerk in the store of Evan C. Kennedy at the corner of Grove and Seventh Streets. In rapid succession he advanced to senior clerk, manager and proprietor. He continued in the latter capacity until illness compelled his retirement a short time before his death.

Mr. Gallagher became a member of the N. A. R. D. in the very beginning of its existence. During the crucial times of its formative period he was always one of the leaders whose advice was treasured by his fellow workers. In 1893 he joined the American Pharmaceutical Association and in 1894 he became a member of the College of Pharmacy of the City of New York becoming a life member in 1914. He was a most enthusiastic member of the Jersey City Retail Druggists Association of which he was an ex-president as well as one of the founders. Mr. Gallagher was elected a member of The New Jersey Pharmaceutical Association in 1899 and in 1915 he was elected to life-membership by the association in recognition of his untiring efforts during his term as president which had just expired.

"John C." as his friends and admirers, who were legion, called him, was ever a power for good in organized pharmacy. Wherever anything concerning his profession, either professionally or commercially, came up he was on the spot and with loyalty and devotion and with untiring energy he brought to bear the influence born of clear head and far-sightedness. Legislative work attracted him and in this field he was at his best. Many a suggested statute was changed for the benefit of pharmacy due to his work with the lawmakers. Some called him a politician. This was not so. He was simply an earnest worker devoted to his chosen profession, ever willing to do much more than his share to make its environments better, who knew how to properly present the questions under debate to those who were not pharmacists. Would that there were many more like him! His loss to organized pharmacy will be a lasting one. His work in The New Jersey Pharmaceutical Association has become a matter of history.

He is survived by his widow, Della C. Gallagher, and one daughter, Hazel.

The funeral took place on the morning of October 4, 1918. from St. Michael's Church, Jersey City.

JEANNOT HOSTMANN.

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